

THE
GREAT
EXHIBITION

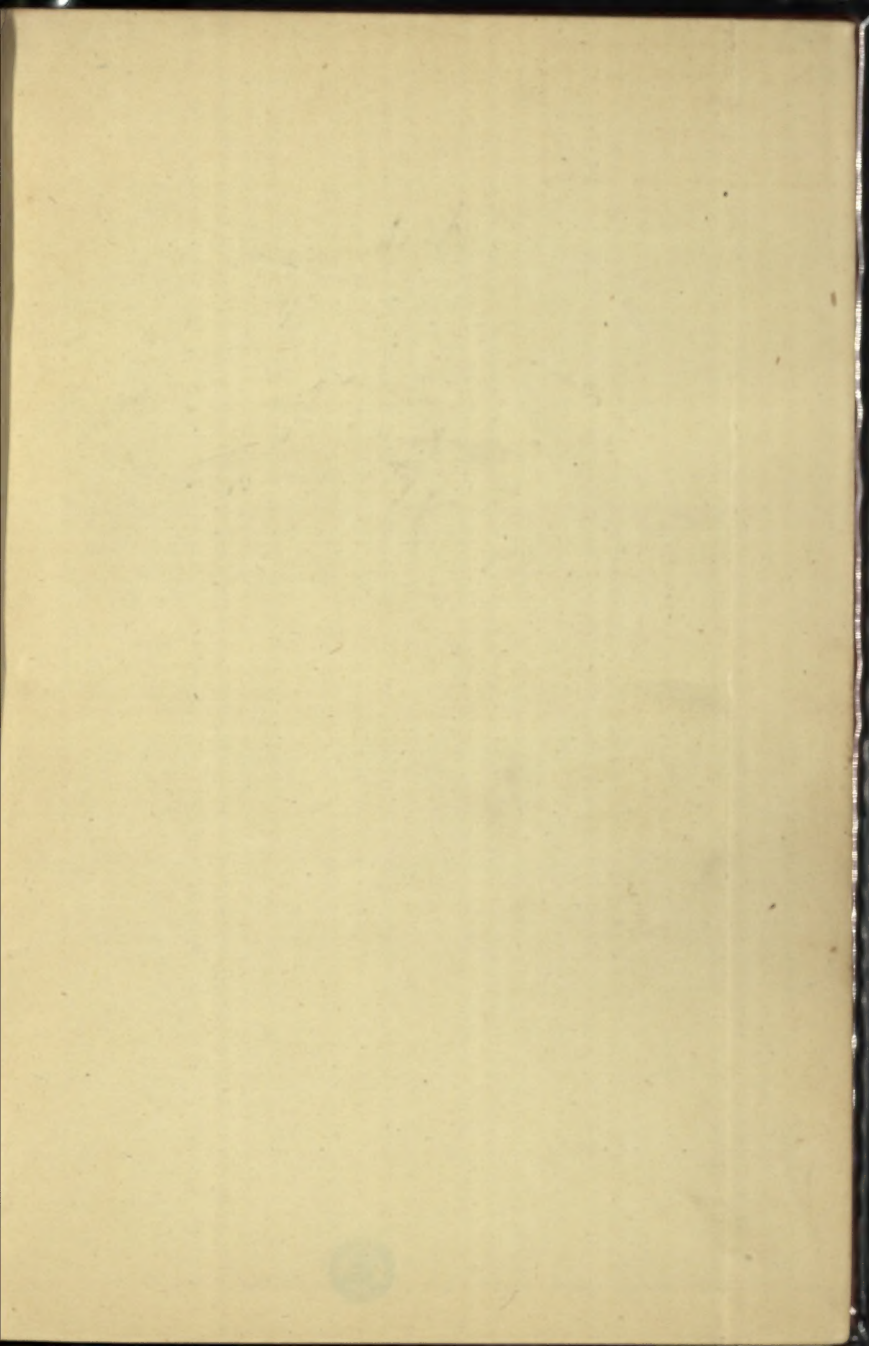


ILLUSTRATED
1851

K. B. DOWSLEY,
TROY, N. Y.

No.

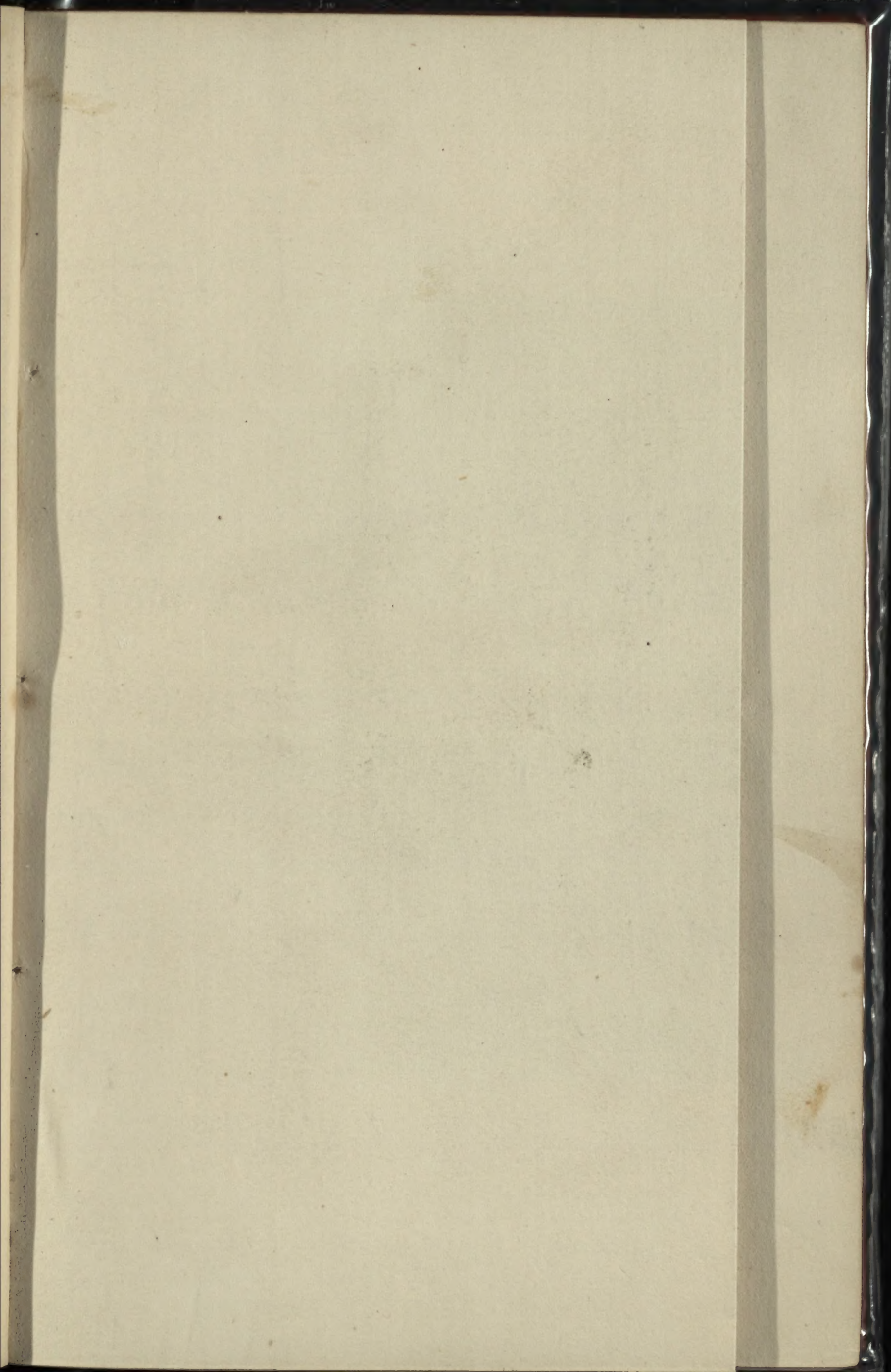
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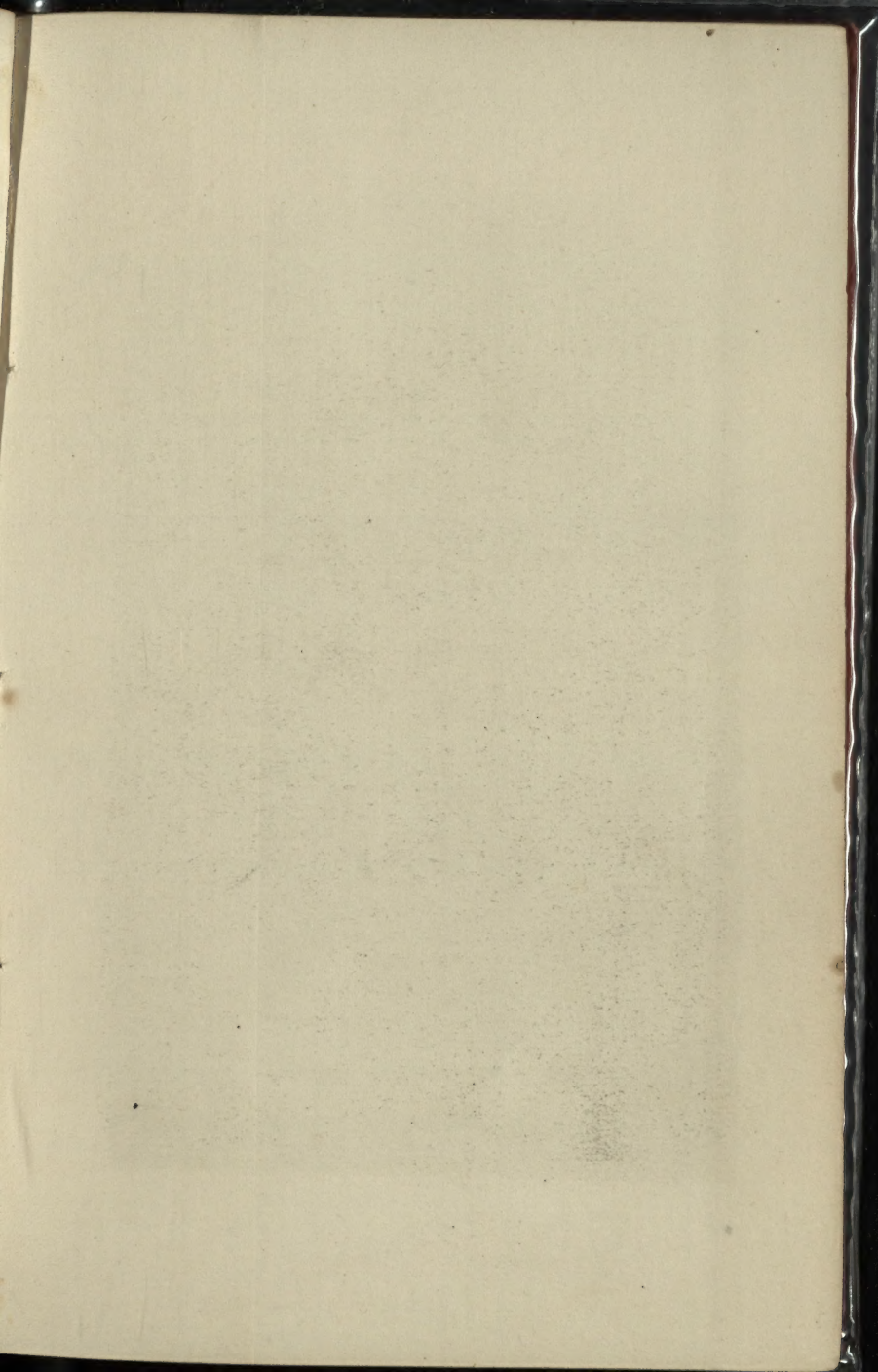


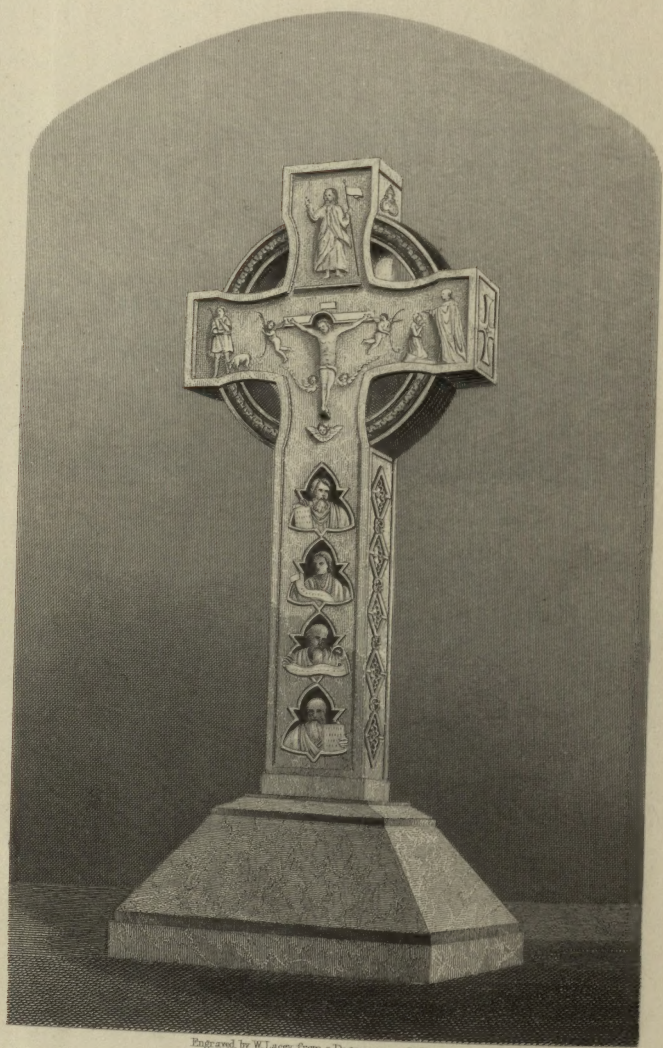




THE MARQUIS OF WELLESLEY.

*Engraved by T. Hollis from a Daguerrotype of the Original Statue by N. Wetton,
which was exhibited at the Great Exhibition of 1851.*





Engraved by W. Lacey from a Daguerrotype by Beazel

MONUMENTAL CROSS.

EXECUTED IN CAEN STONE BY THE HON^{BLE} MRS. ROSS.

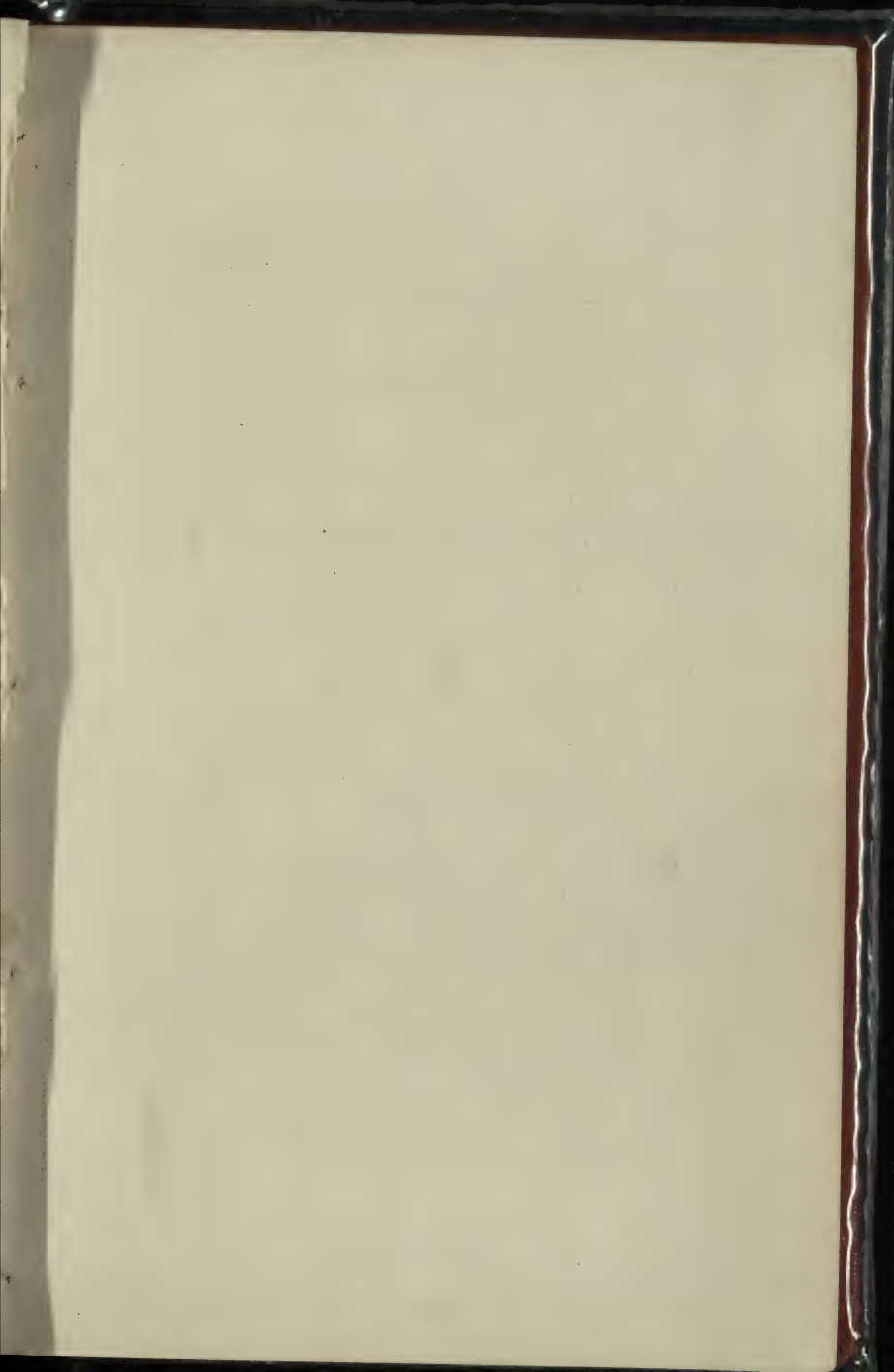




Engraved by W. Henry Jones & Co. from a drawing by N. J. Cottingham

SPANDRIL FROM HEREFORD CATHEDRAL.

DESIGNED BY N. J. COTTINGHAM.

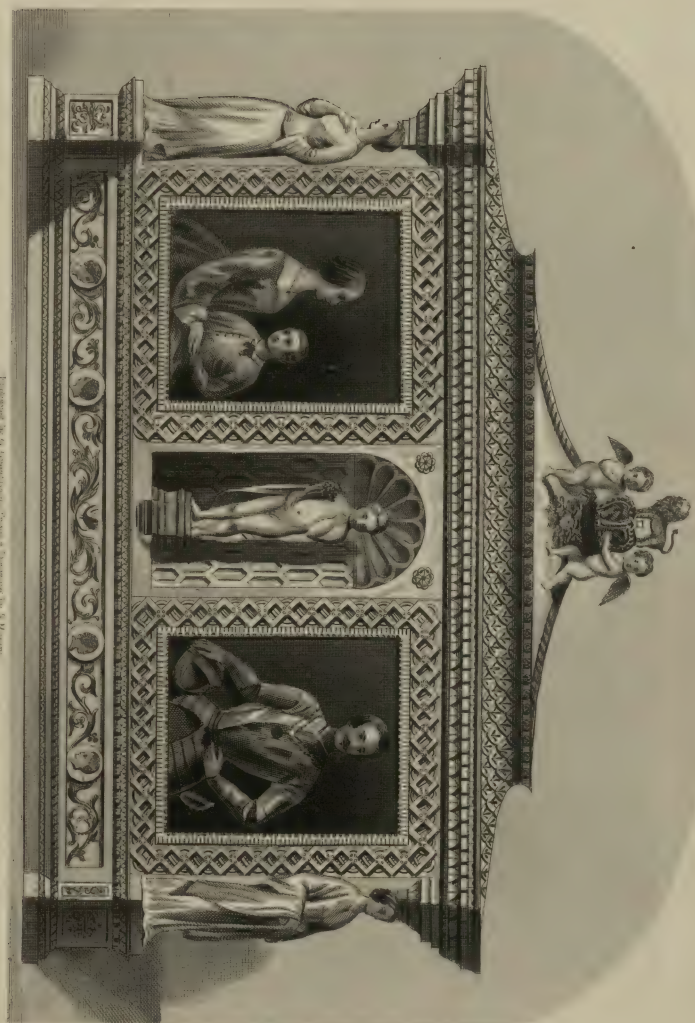




THE UNIVERSITY OF CHICAGO

THE EMPEROR OF RUSSIAS LEVEL CASKET

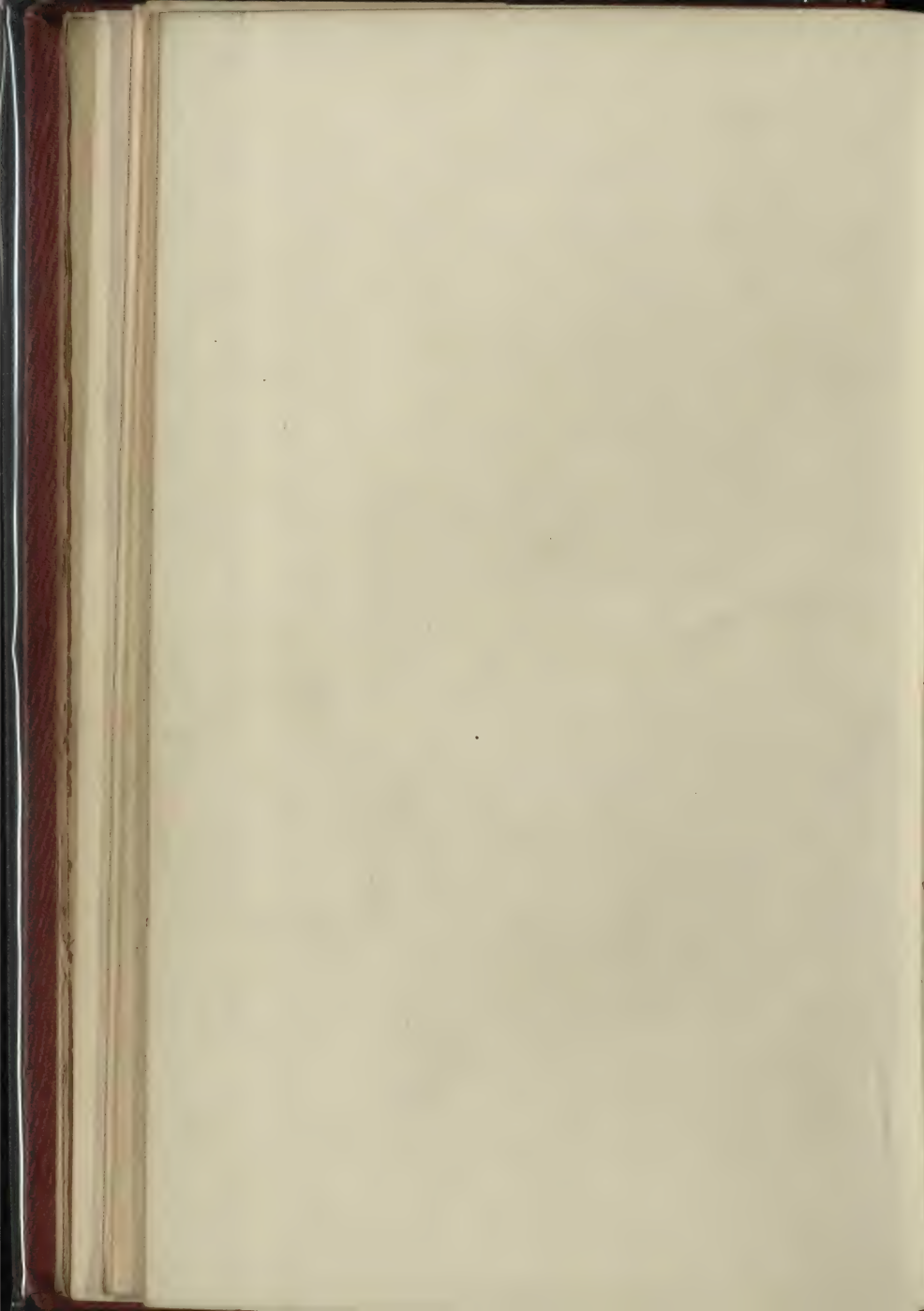


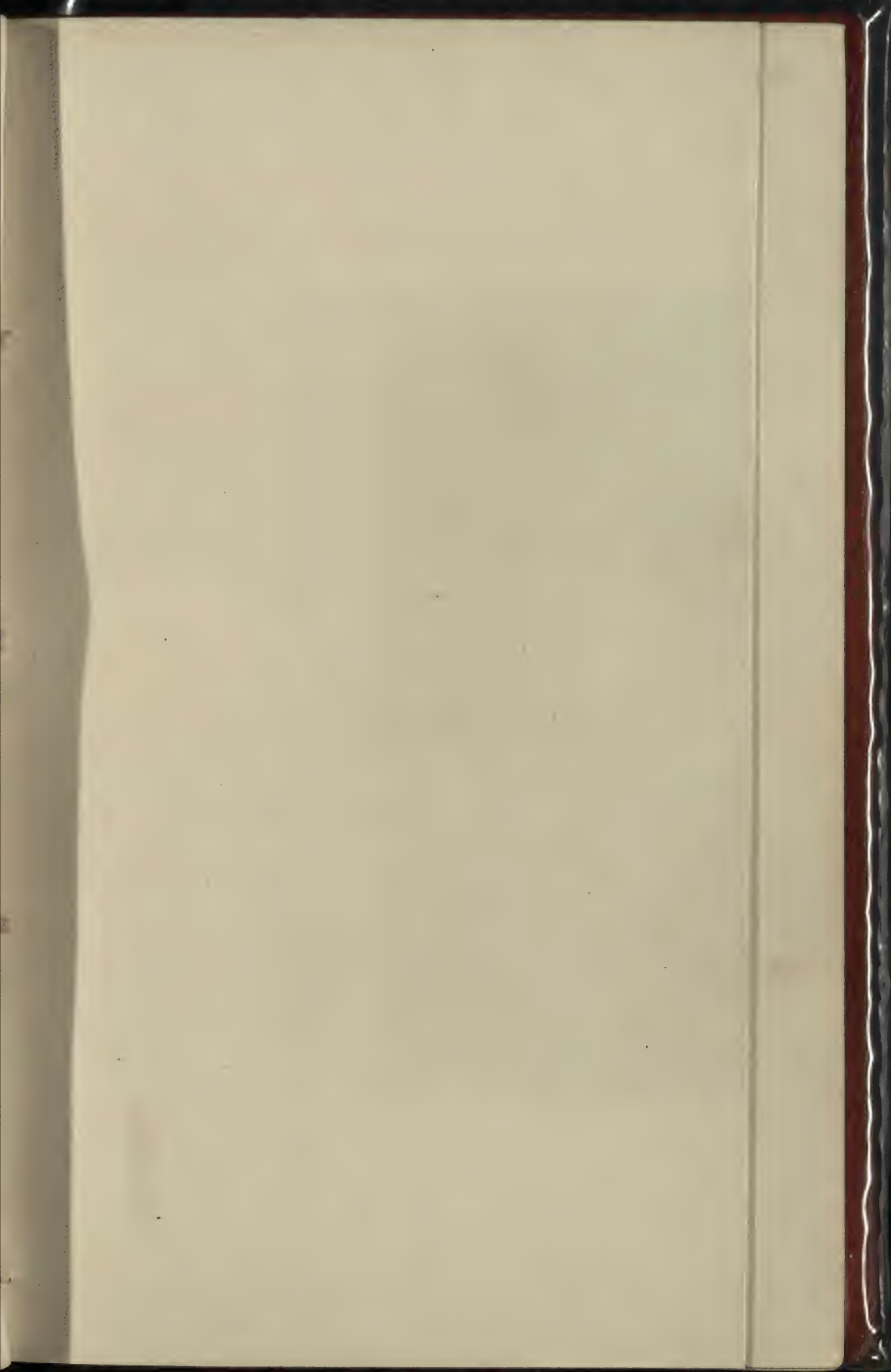


Designed by Mr. G. H. Brown, and executed by J. Brown.

HER MAJESTY'S JEWEL CASE.

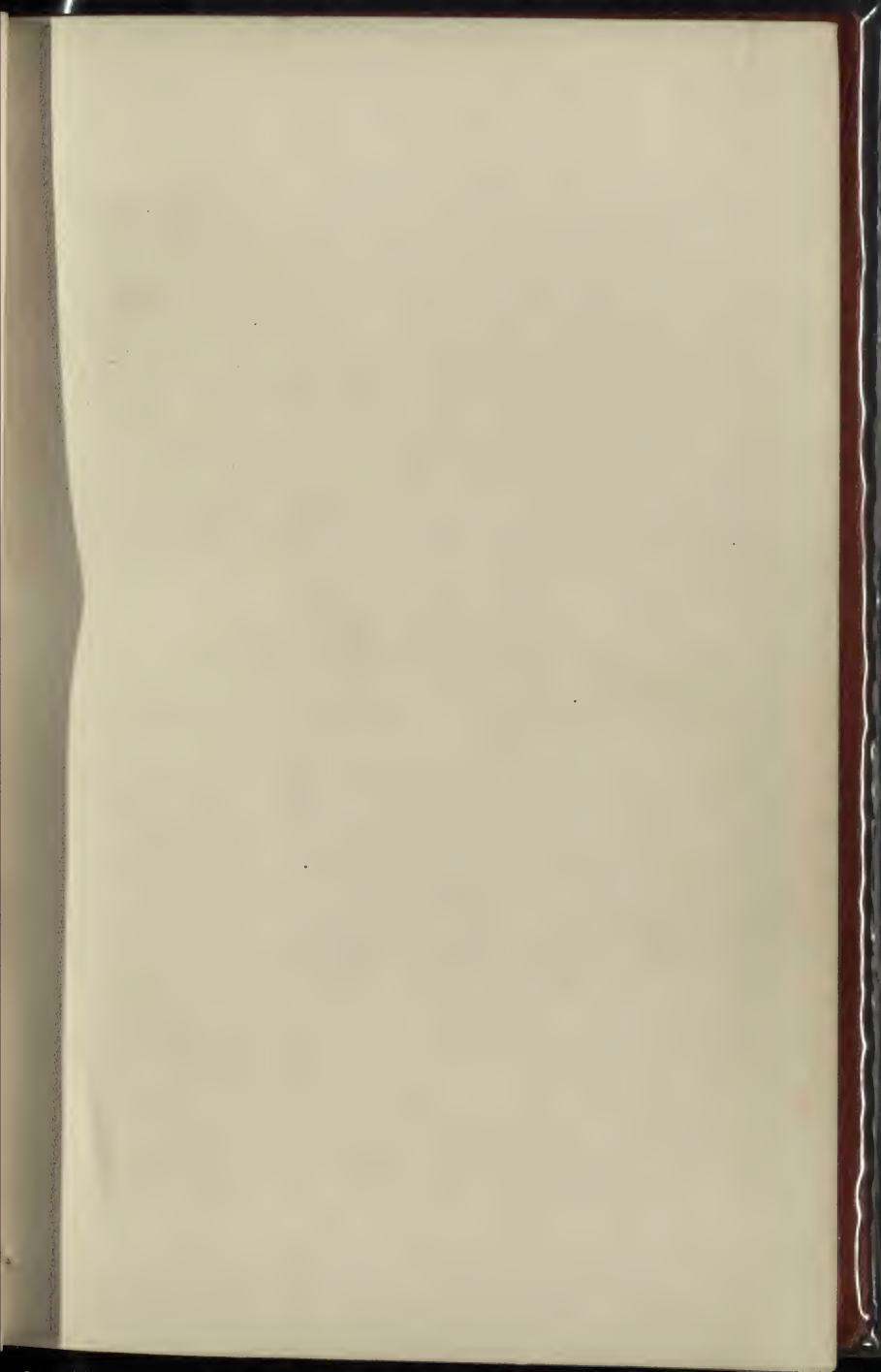
IN THE CINQUE CENTO STYLE BY G. H. BROWN, ESQ. AND J. BROWN.

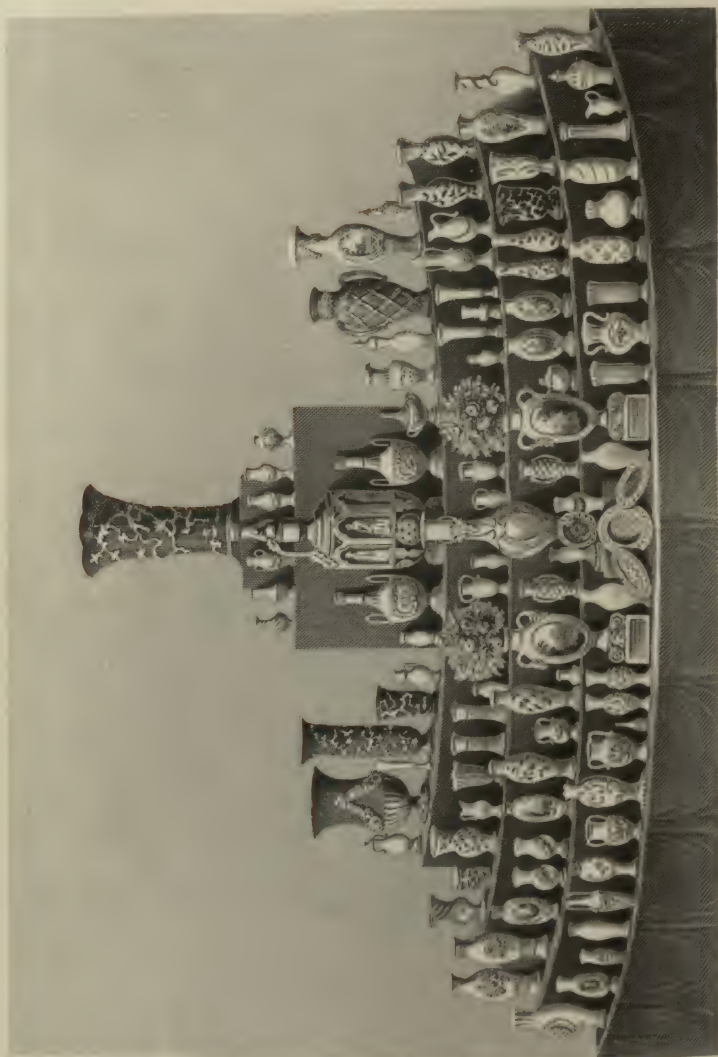


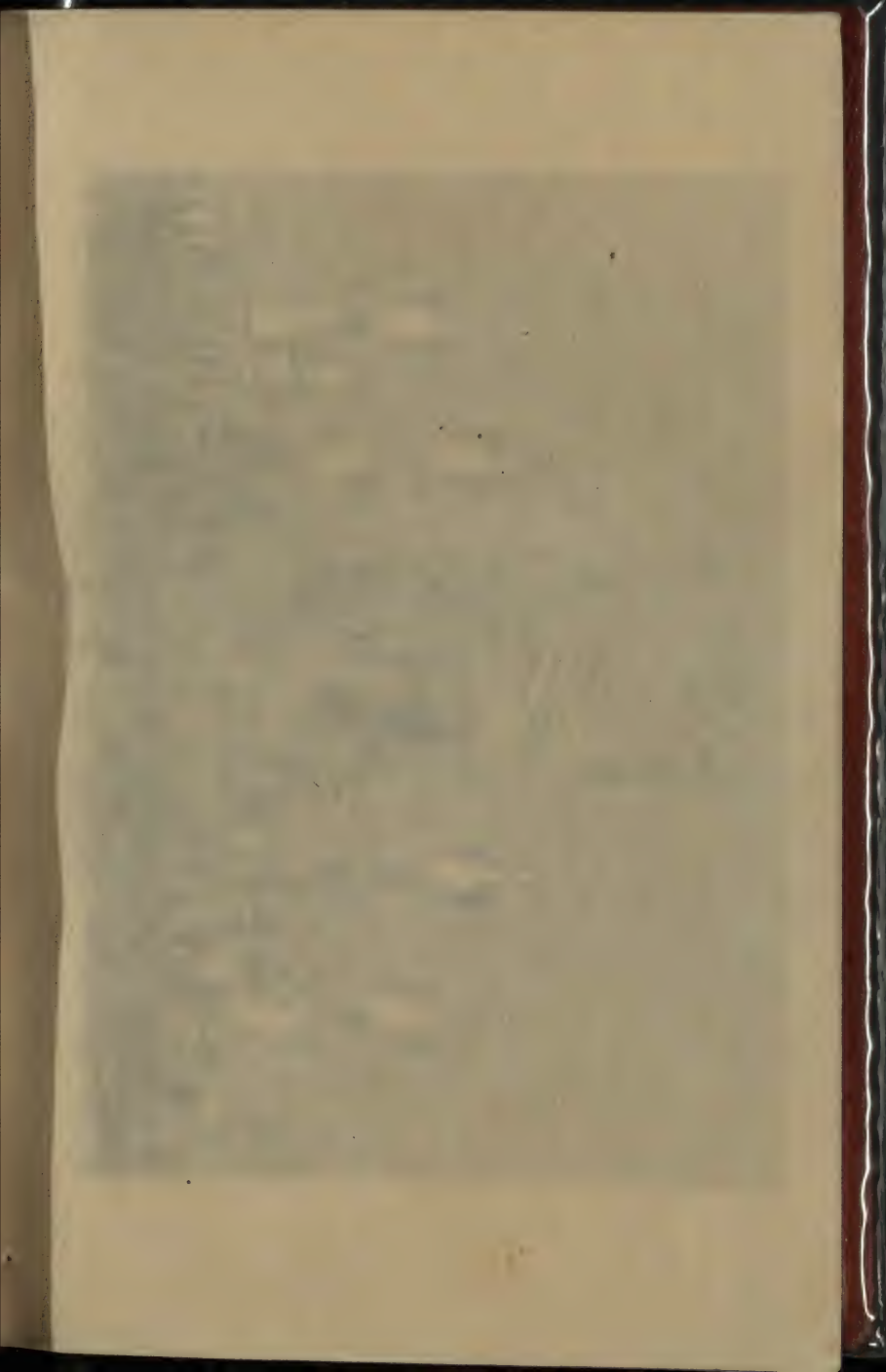


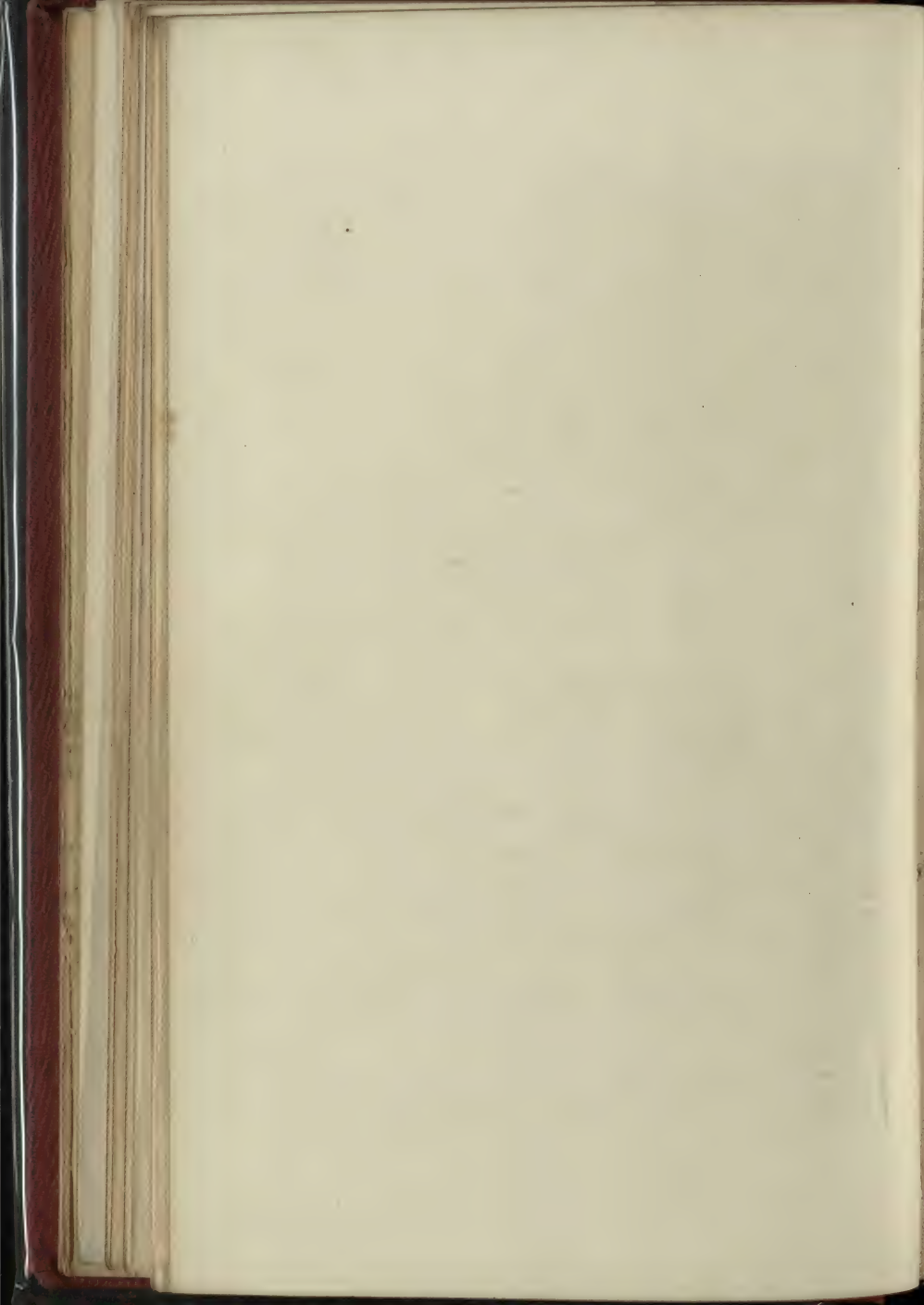


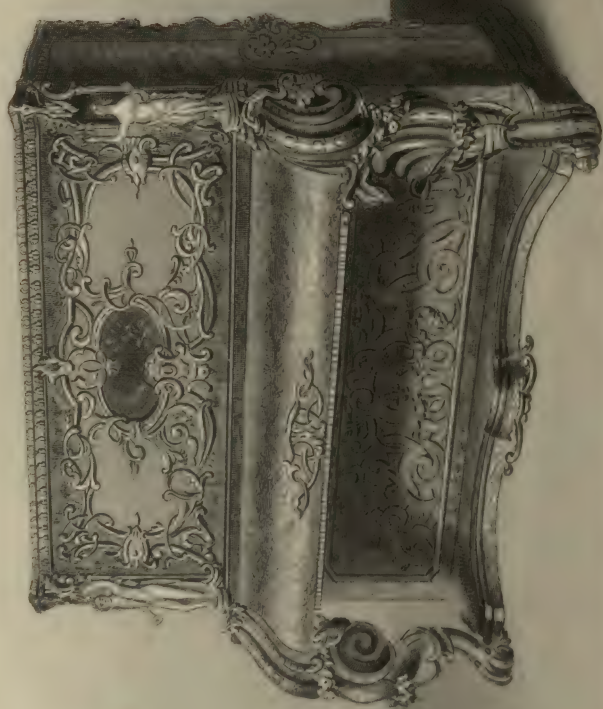
THE VEILED VESTAL
FROM THE ORIGINAL BY RAFFAELLE MONTI



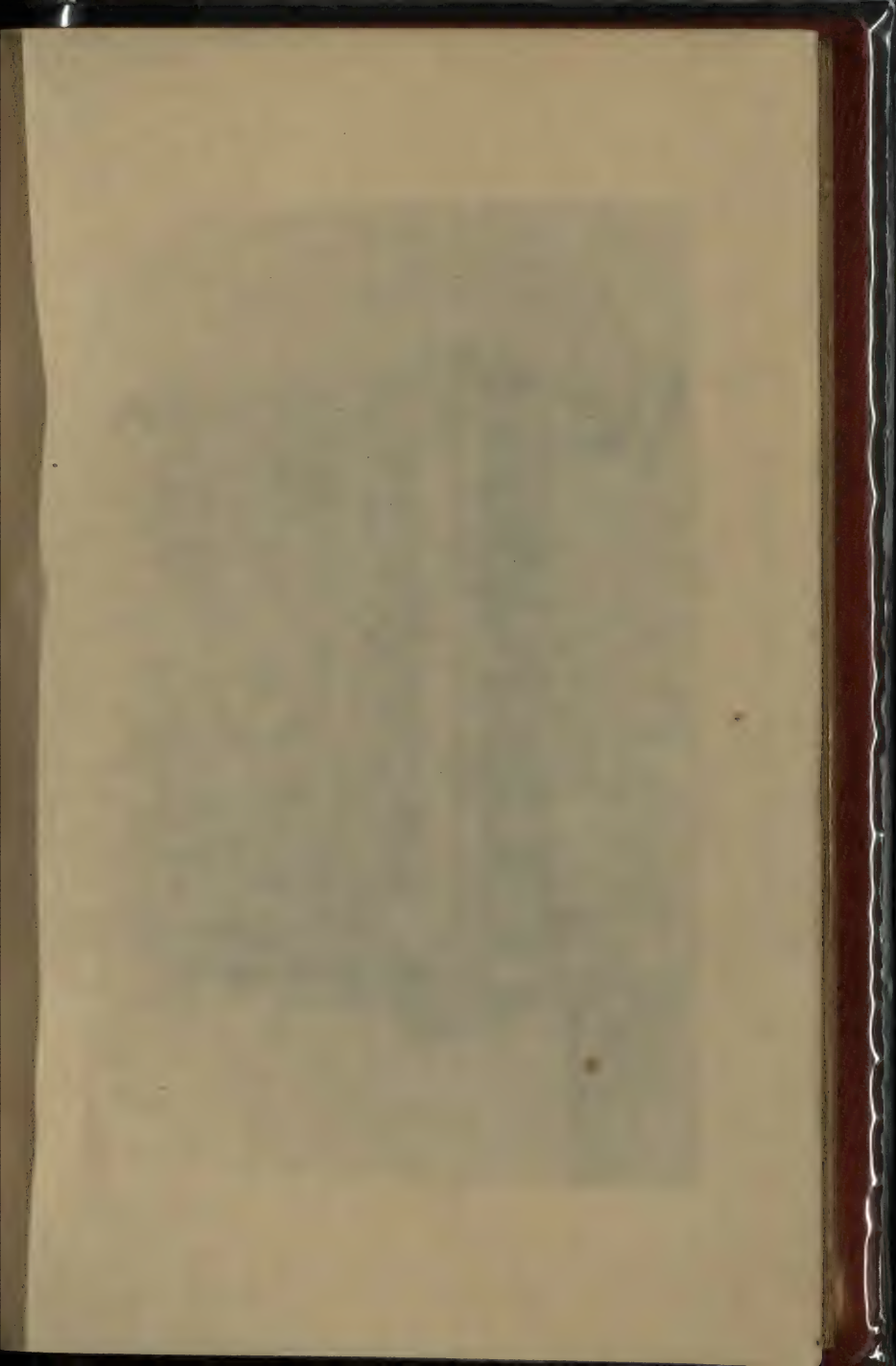


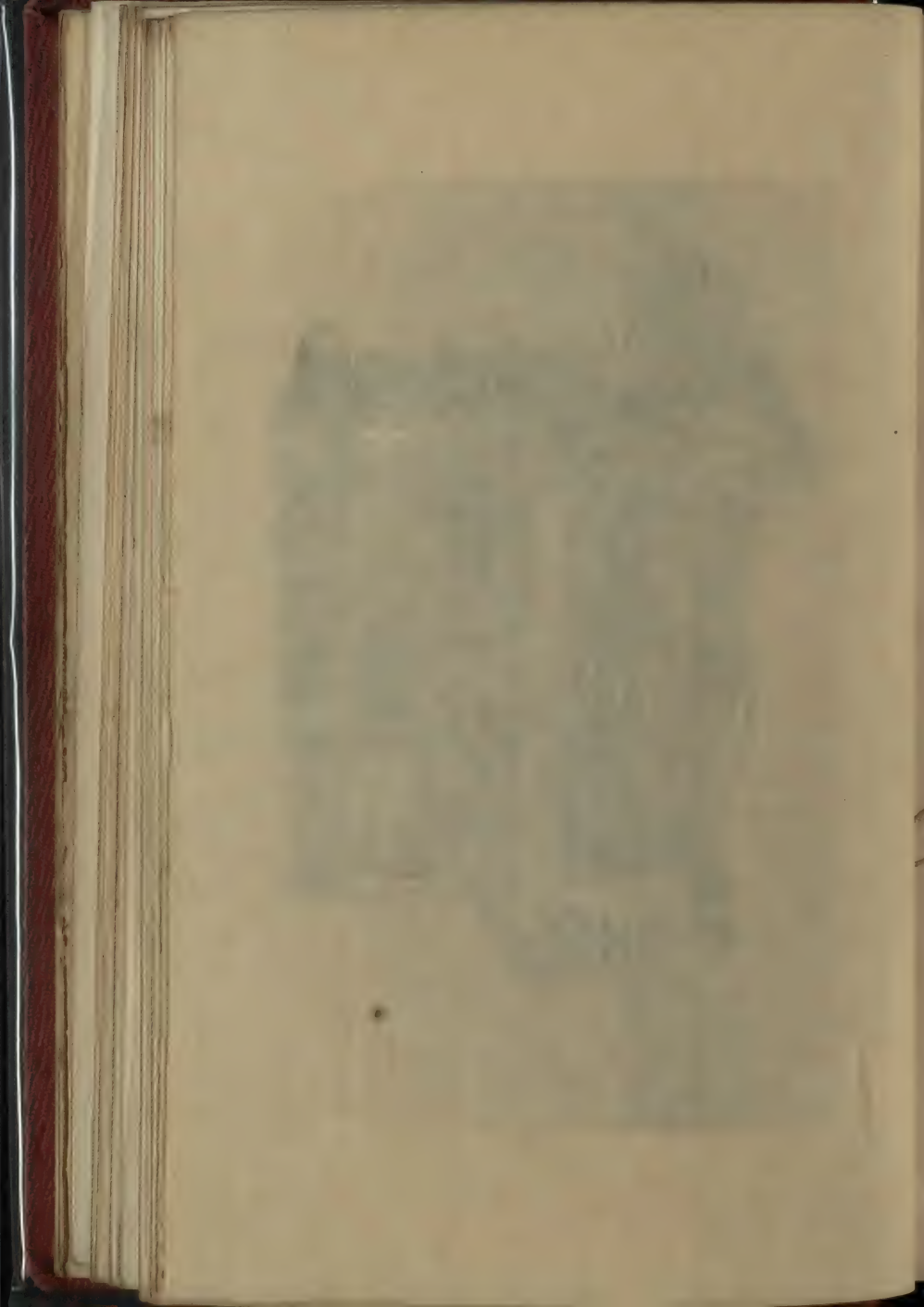


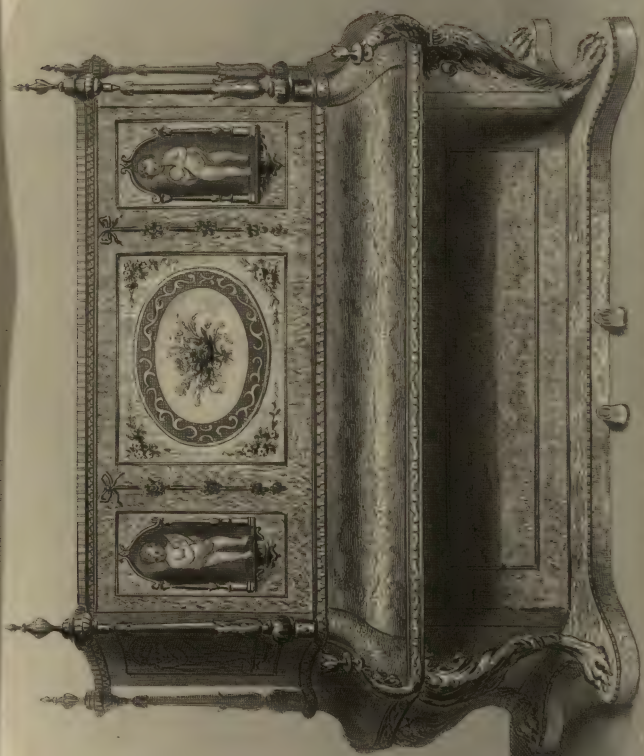




REGISTERED PIANOFORTE WITH IMPROVED Joints

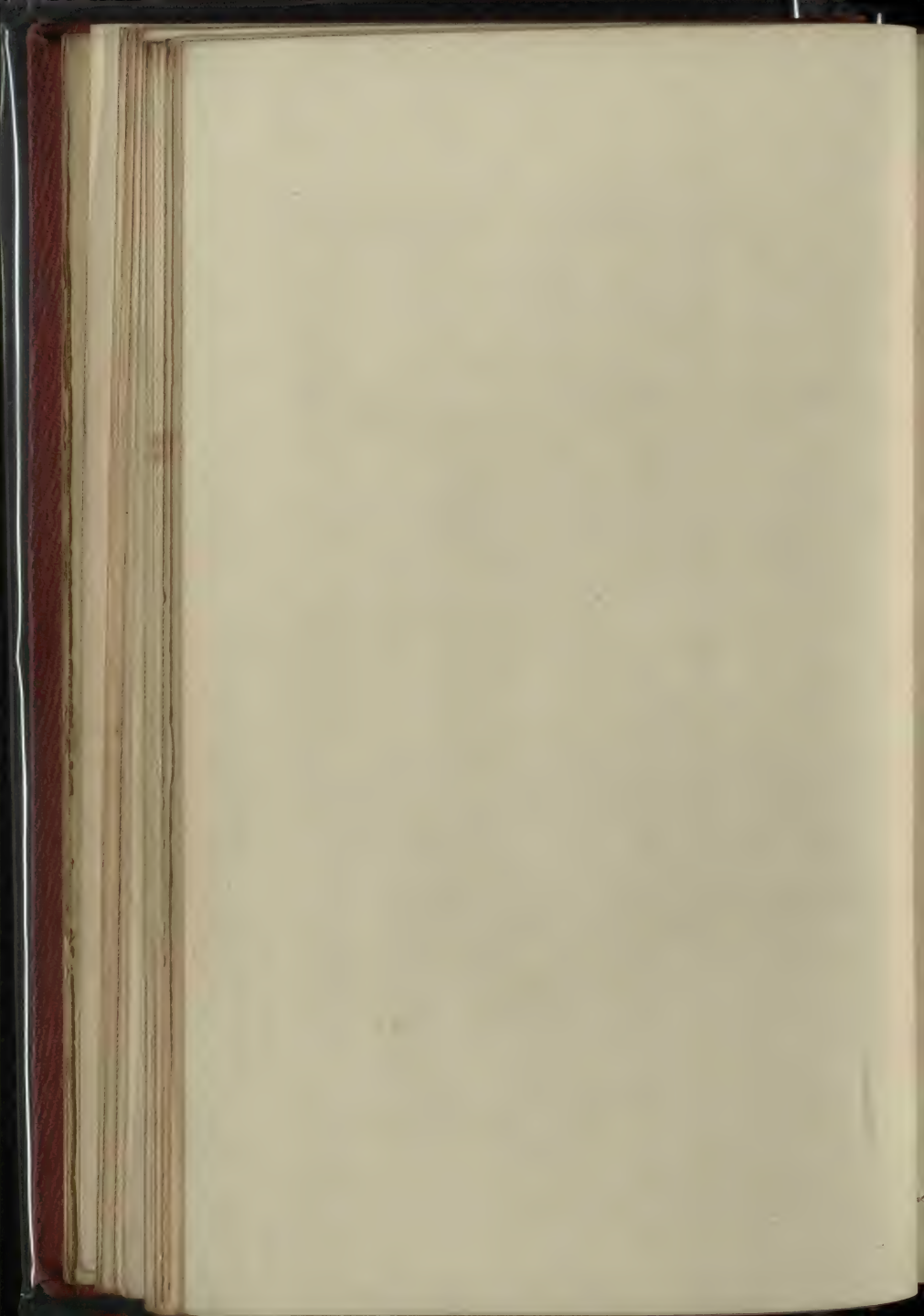


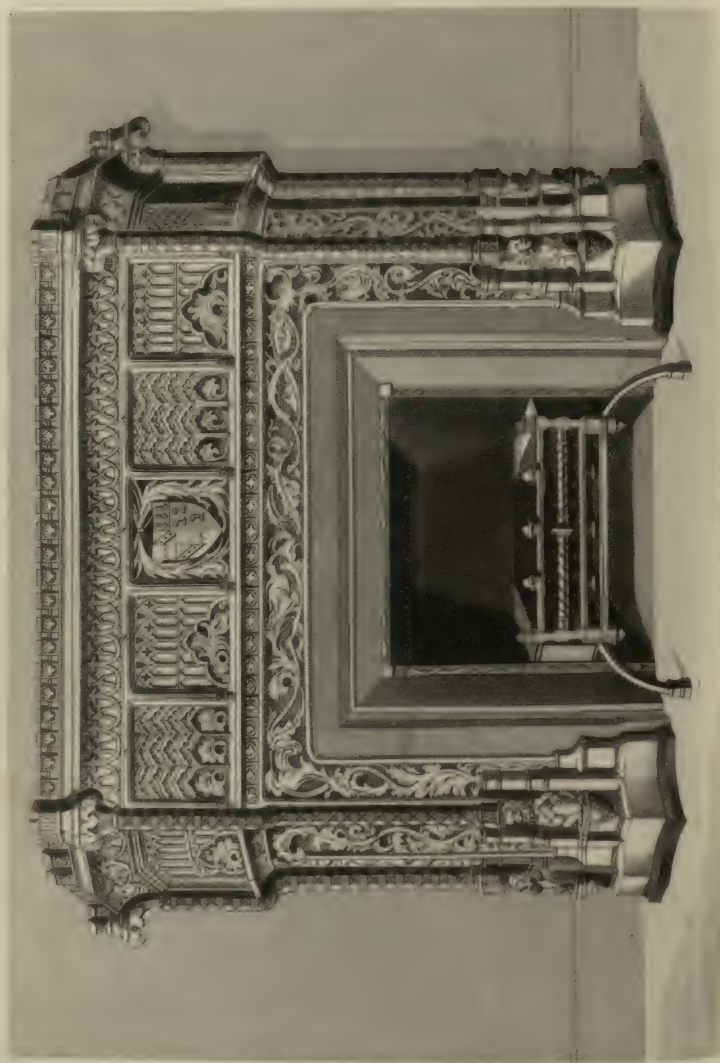


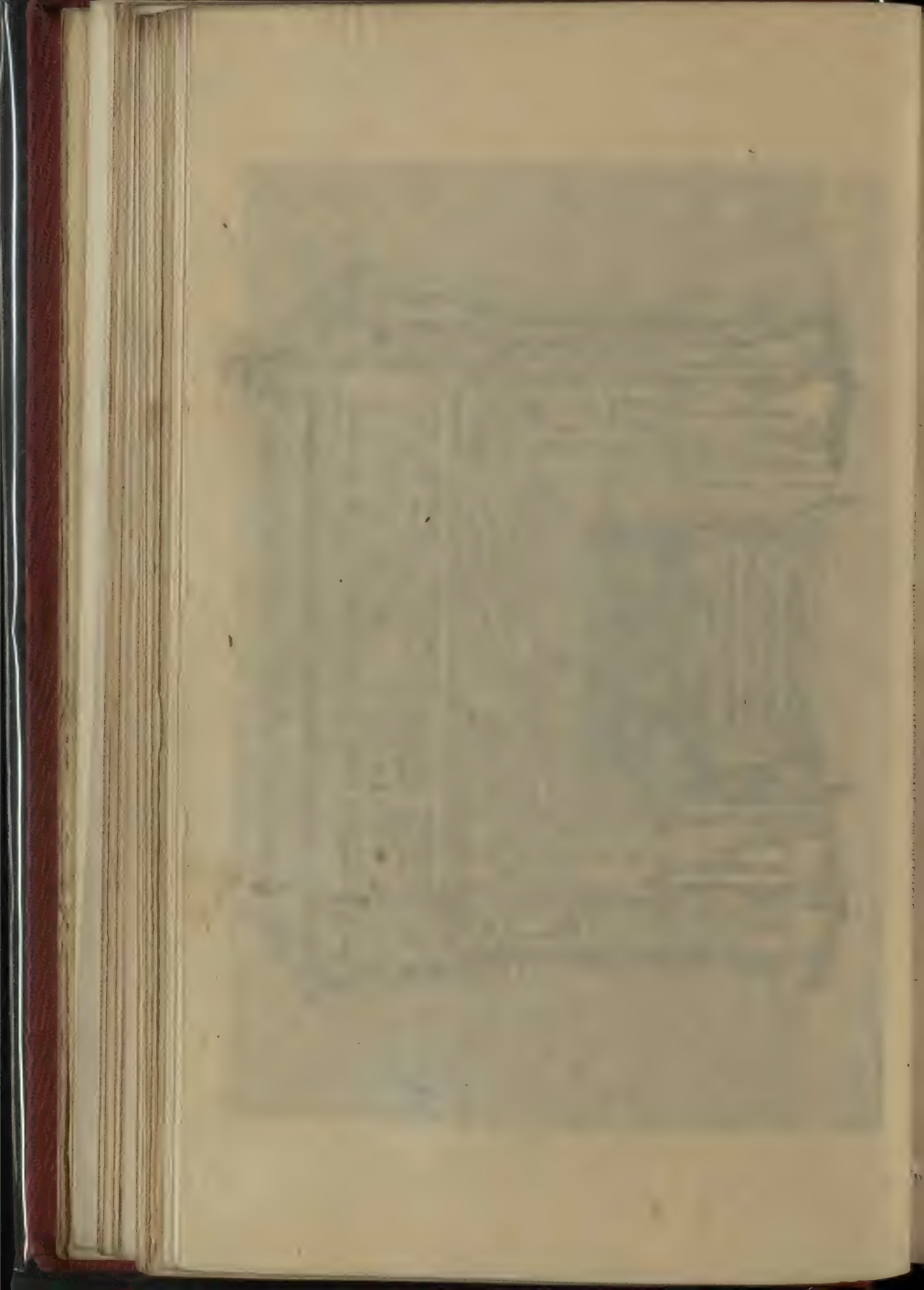


THE COUNTRY HOUSE, FROM A SKETCH BY G. H. HARRISON.

WALNUT TREE WOOD COTTAGE FIANCERIE







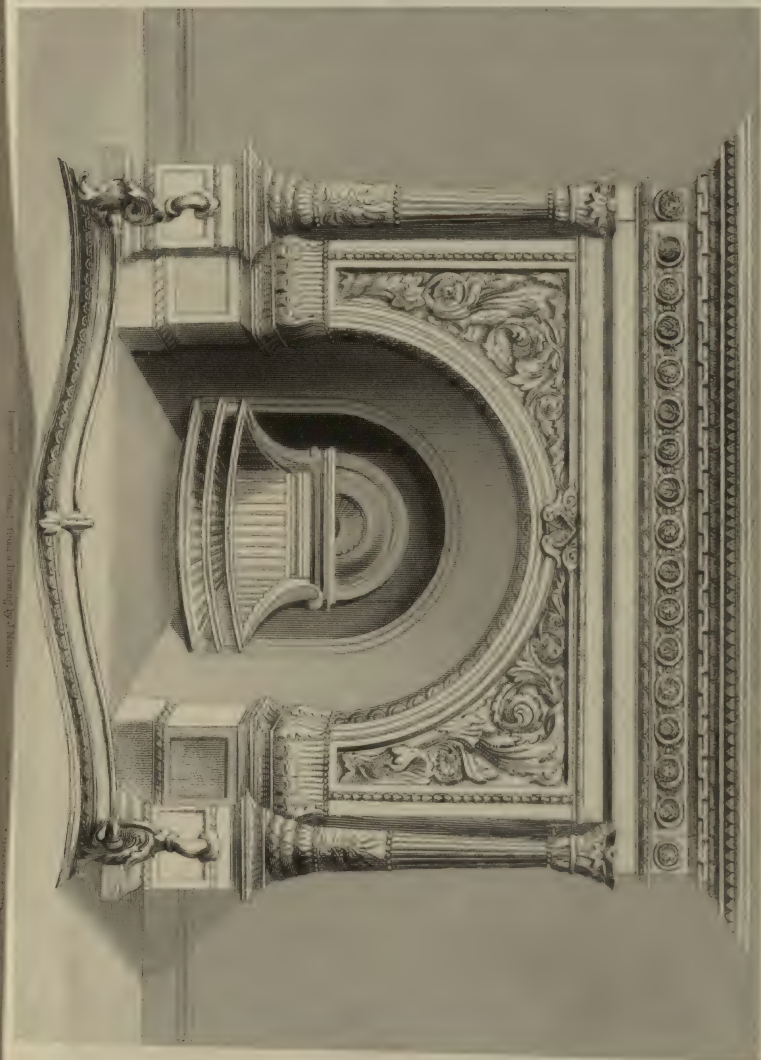
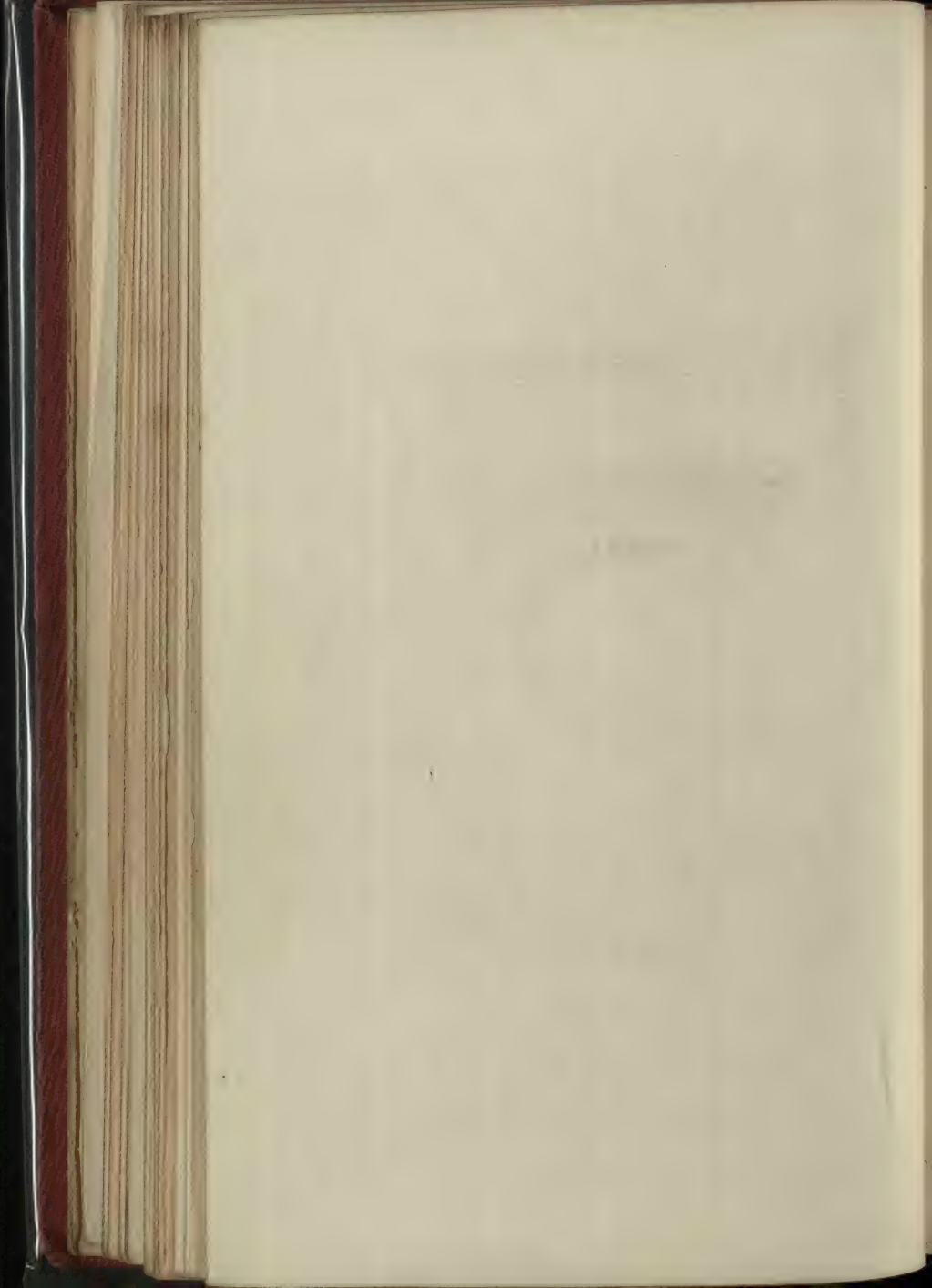
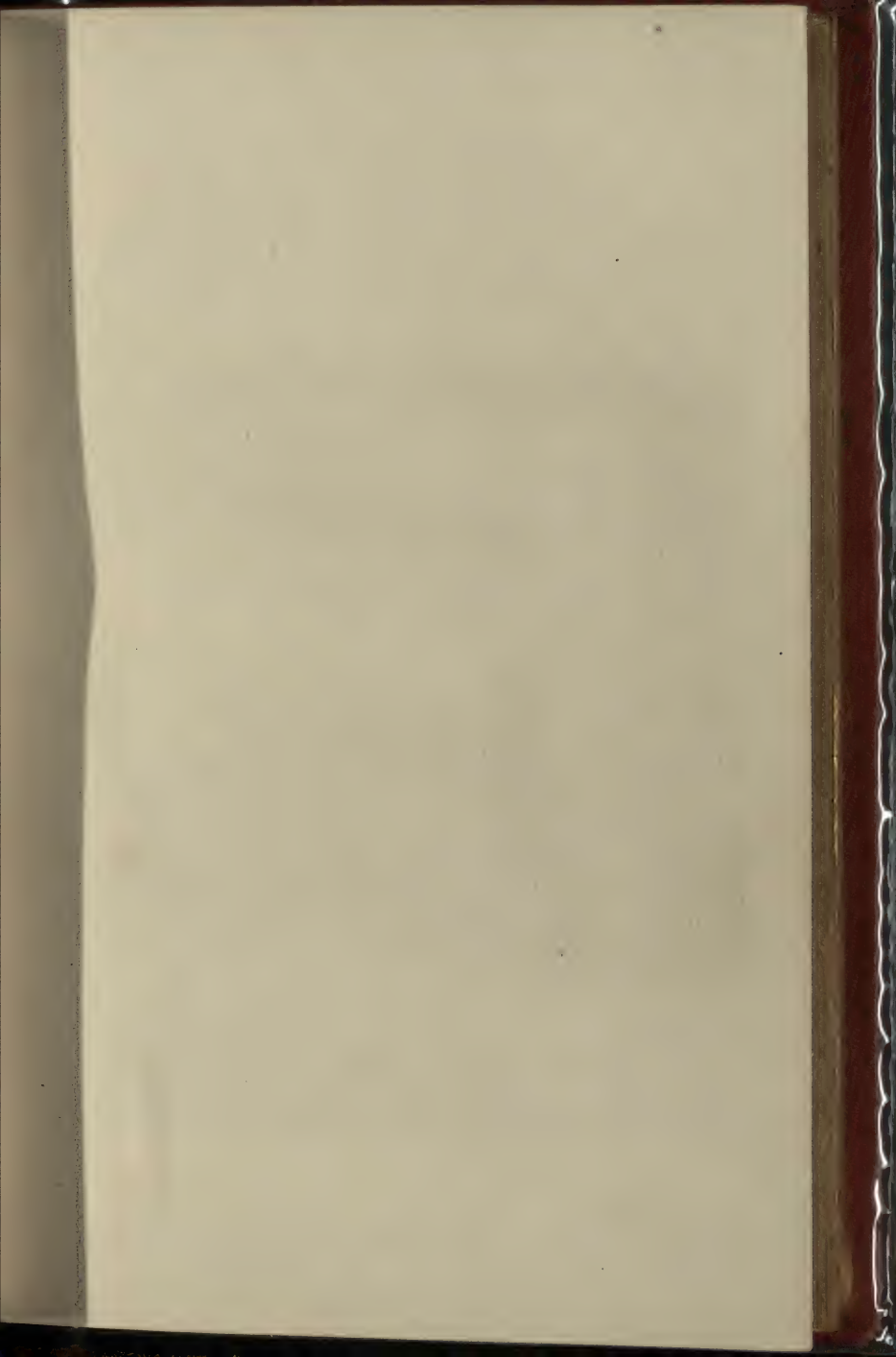


FIG. 1. — FIRE PLACE IN IRON AND ORMOLU.



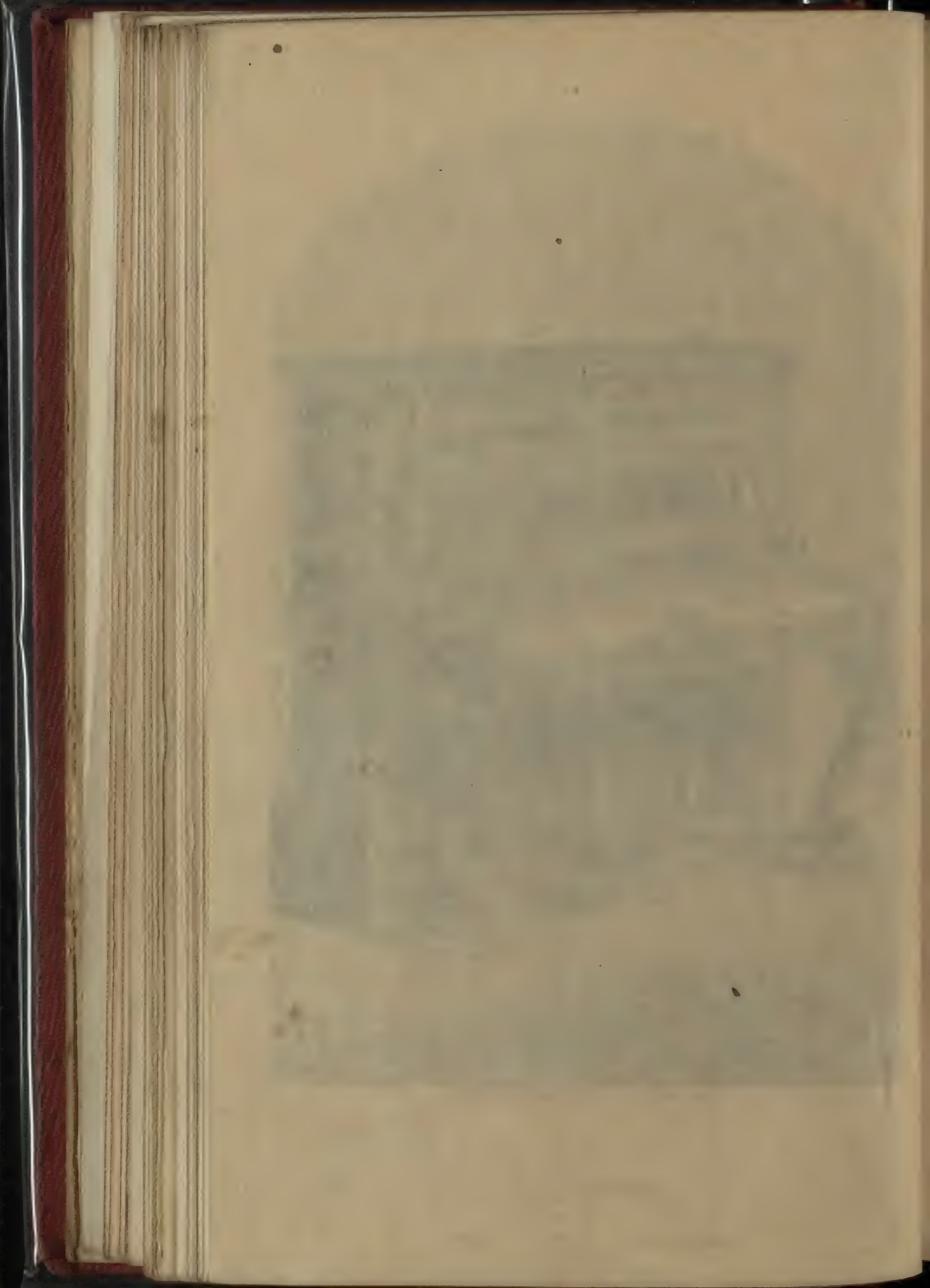




Patented by Kirkman & Son, 11, Abchurch Lane, London.

PIANOFORTE.

MANUFACTURED BY KIRKMAN & SON.

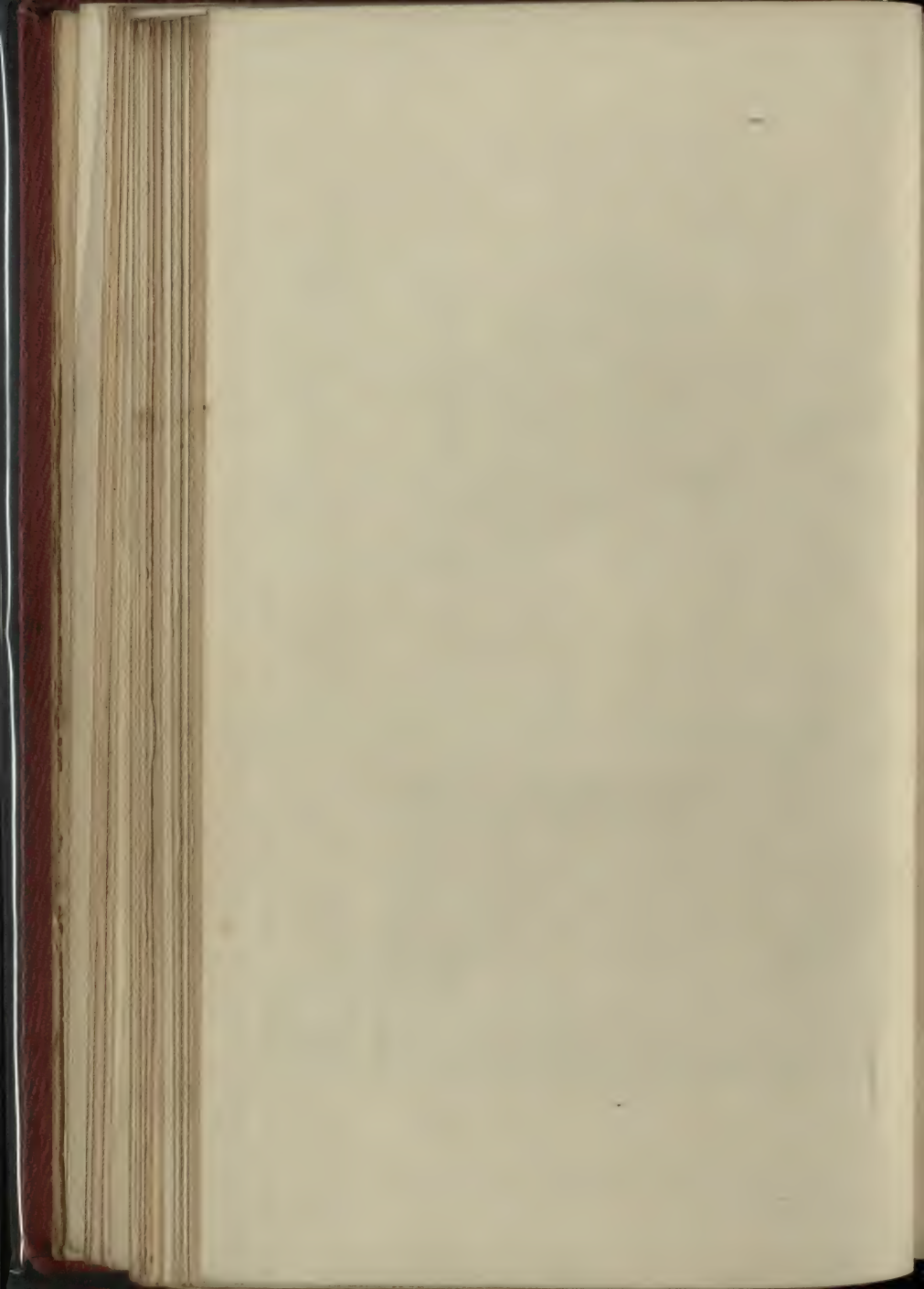


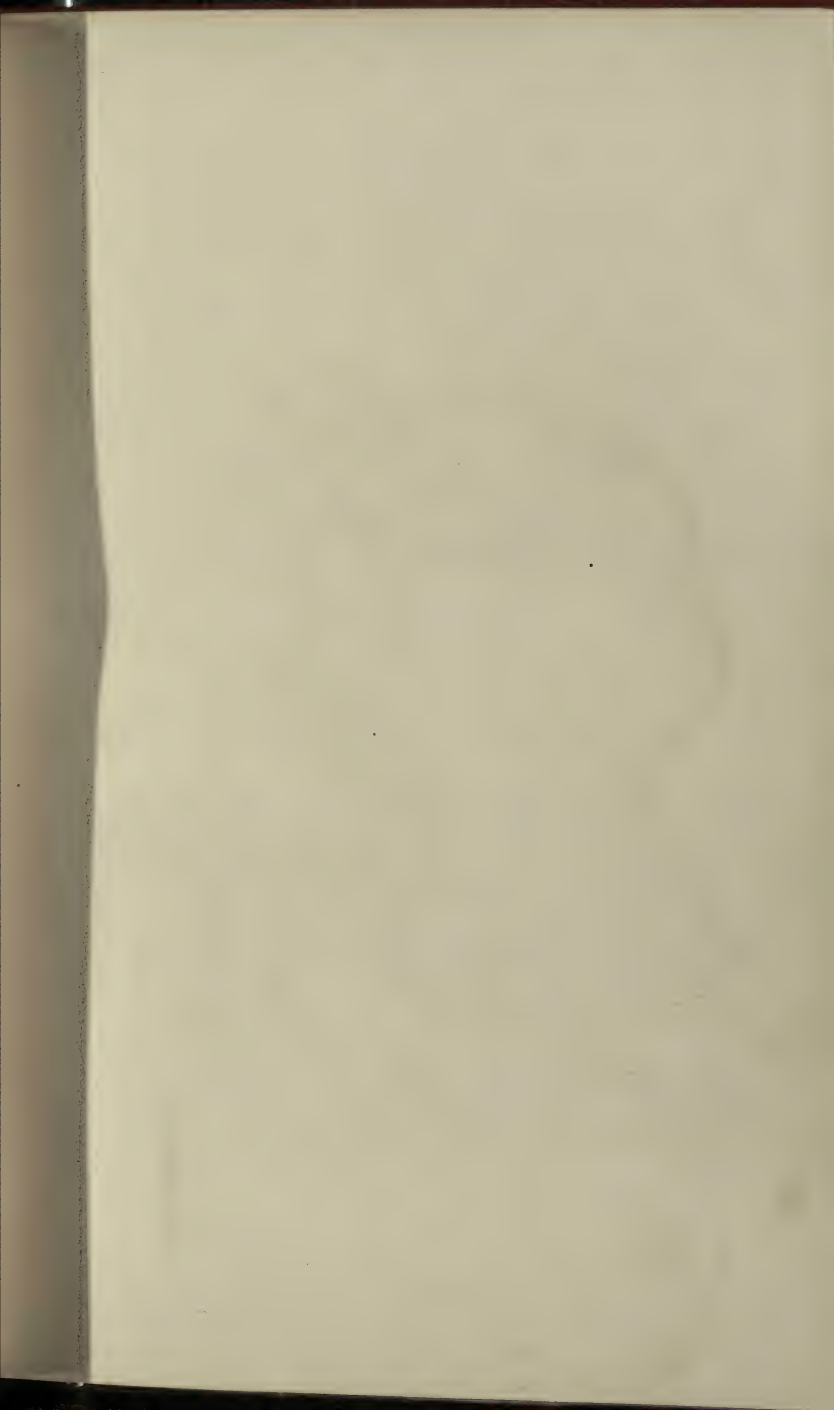


Engraved by G. Kneller from a drawing by W. Kneller.

PIANOFORTE - ELIZABETHAN STYLE

MANUFACTURED BY WILKINS & SONS







Engraved by T. Hollis from a Drawing by J. Mamm.

THE BARBER.

FROM THE COLLECTION OF COMICAL CREATURES FROM WÜRTTEMBERG

BY H. PLOUQUET OF STUTTGARD



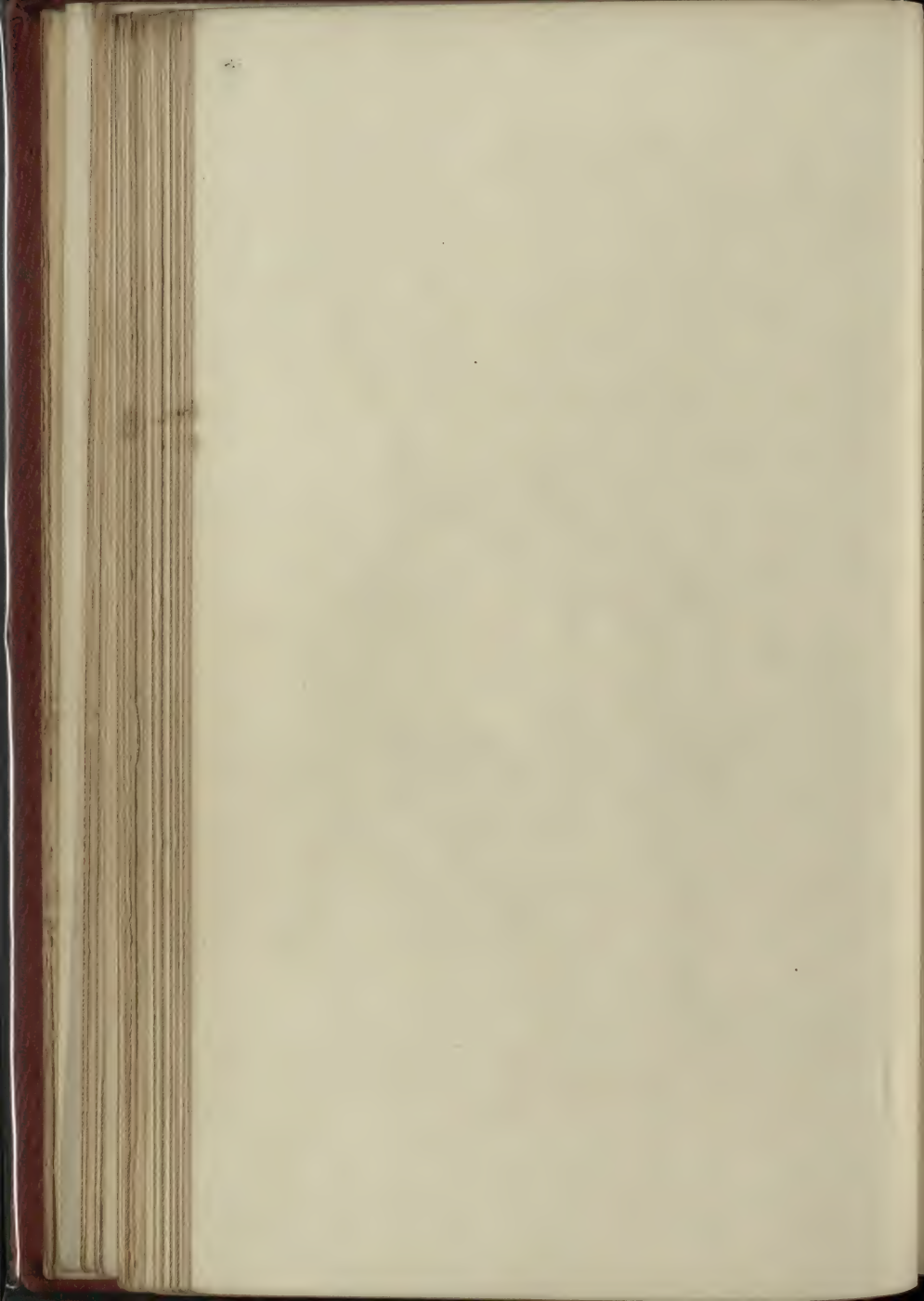


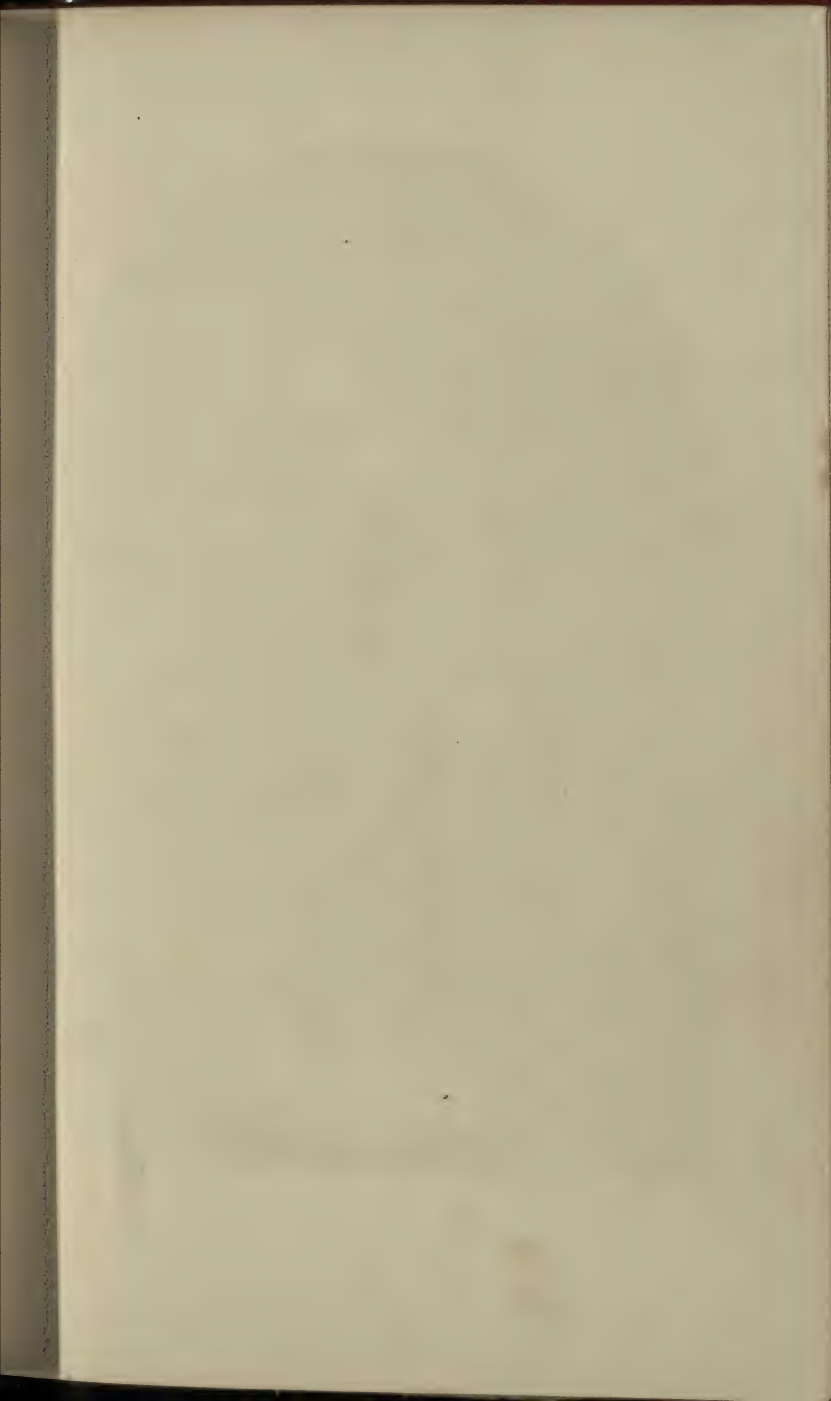
Engraved by T. Hollis from a Drawing by J. Mason

THE PIANIST

FROM THE COLLECTION OF COMICAL CREATURES FROM WIRTEMBERG

BY H. PLOUQUET OF STUTTGART.







Engraved by J. C. Lough from the original by J. C. Lough

TITANIA

FROM THE ORIGINAL BY J. C. LOUGH



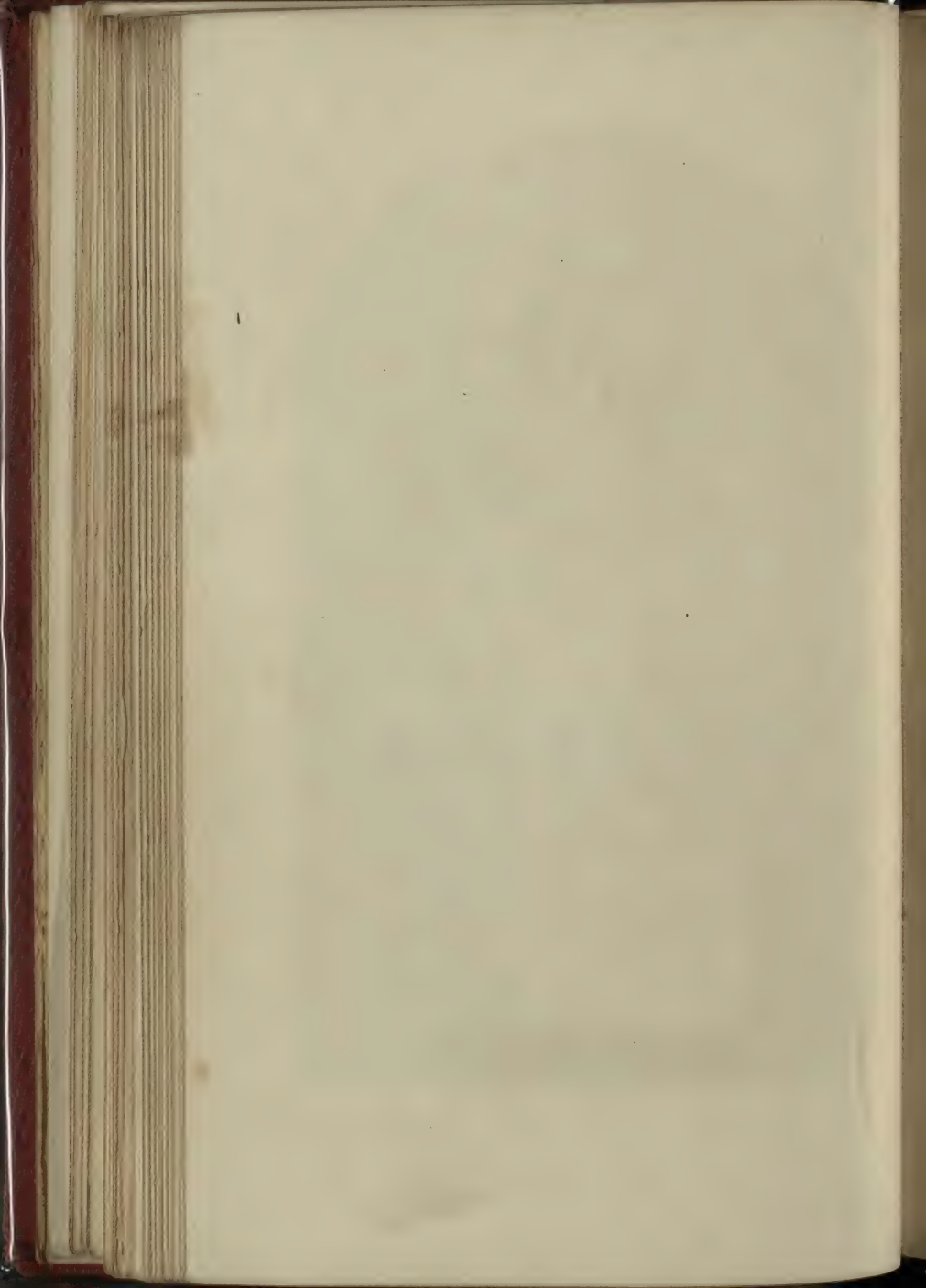


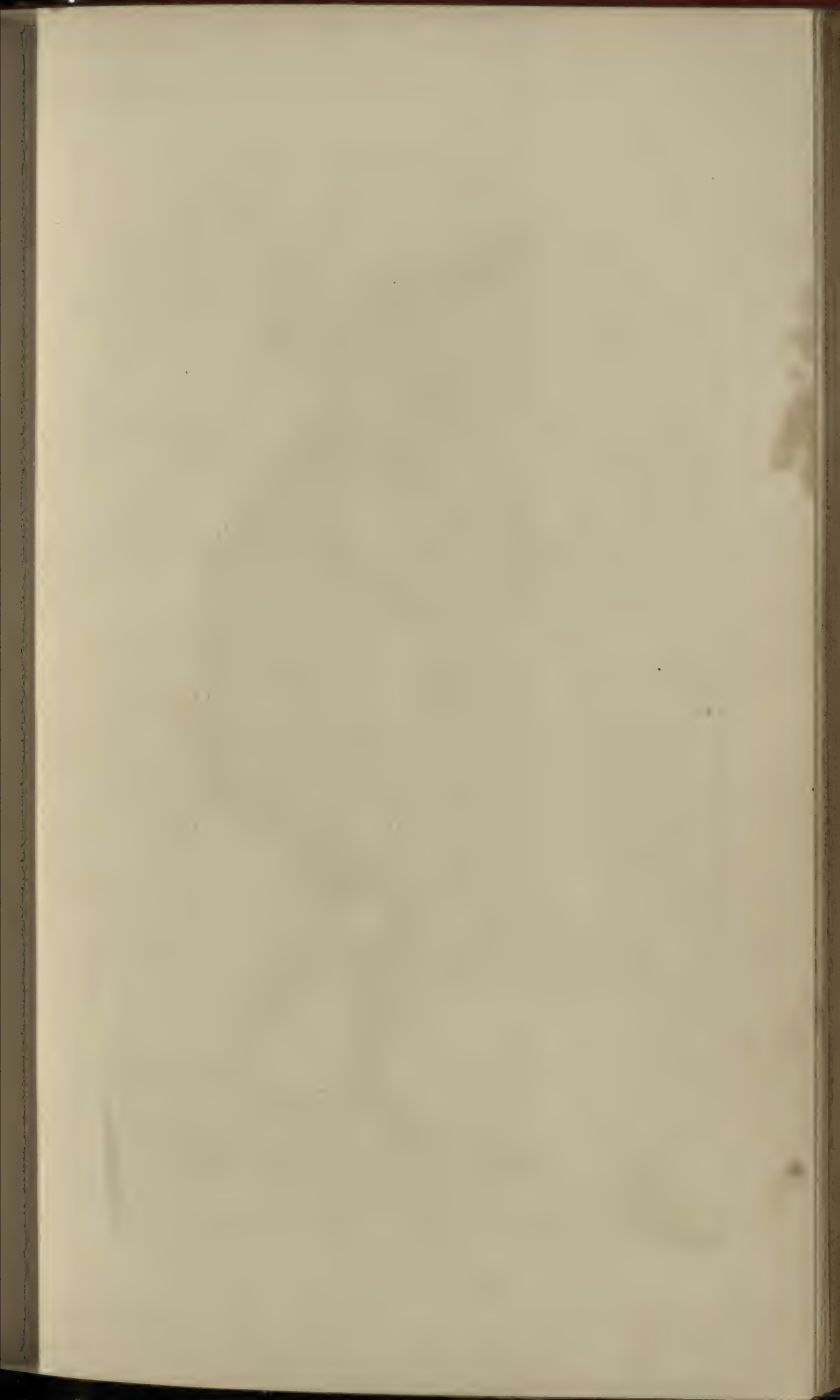


Designed by Giovanni Stanetti sculptured by Rayall

ARIEL

FROM THE ORIGINAL BY J.C. LOUCH



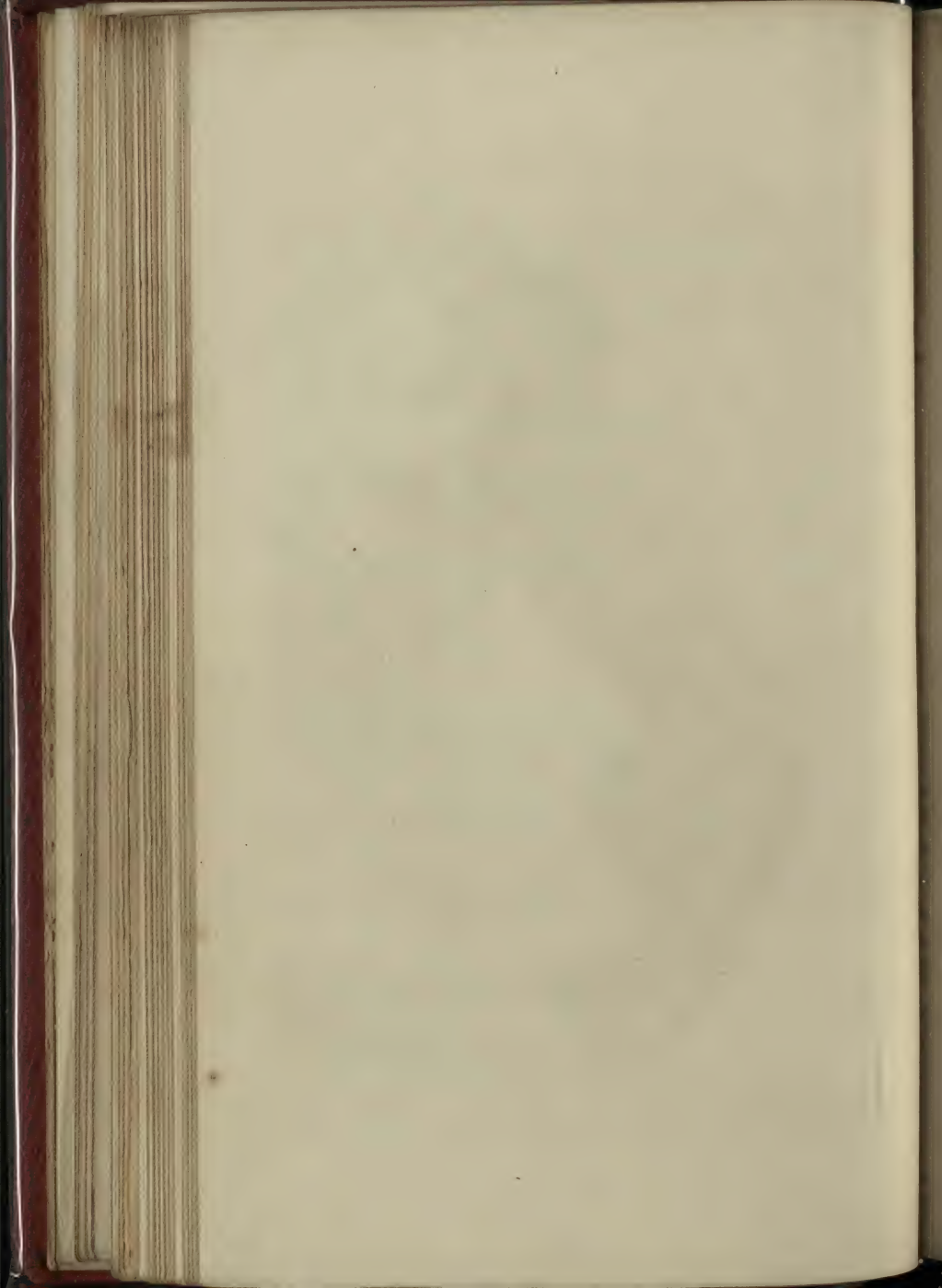




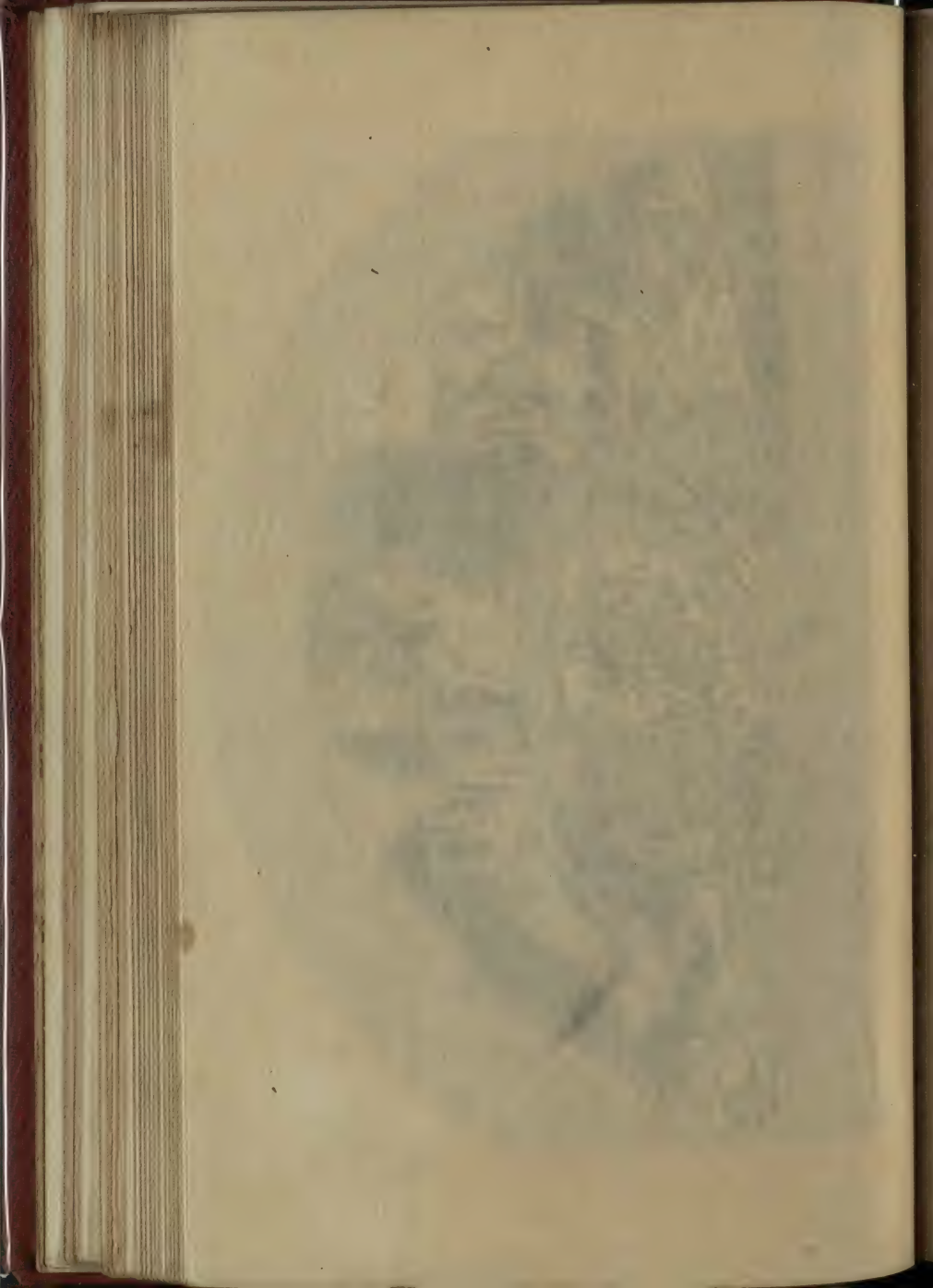
Engraved by Thomas Agnew & Sons, London, from a drawing by J. H. R. Smith.

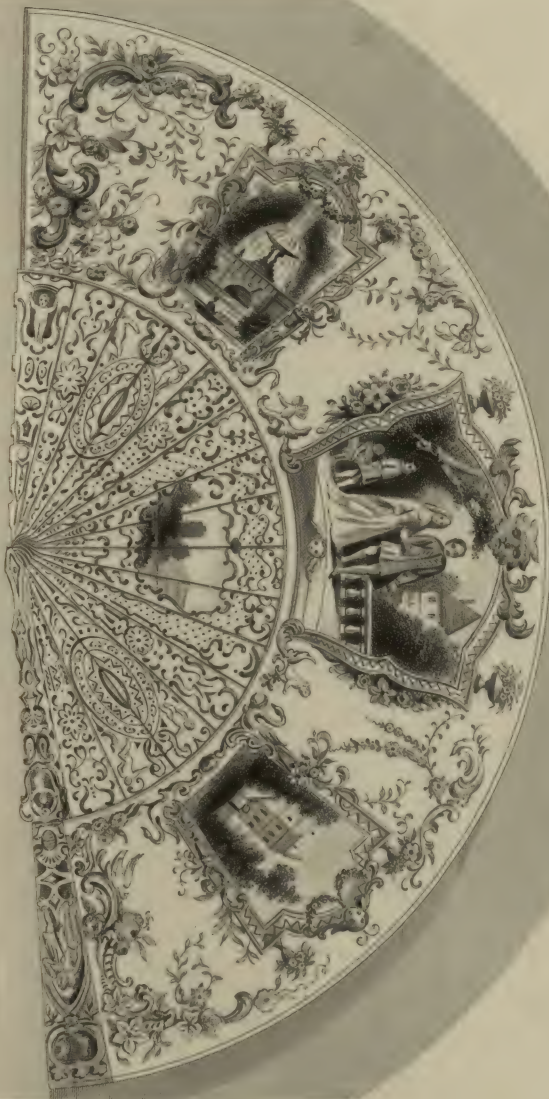
THE MORNING WALK



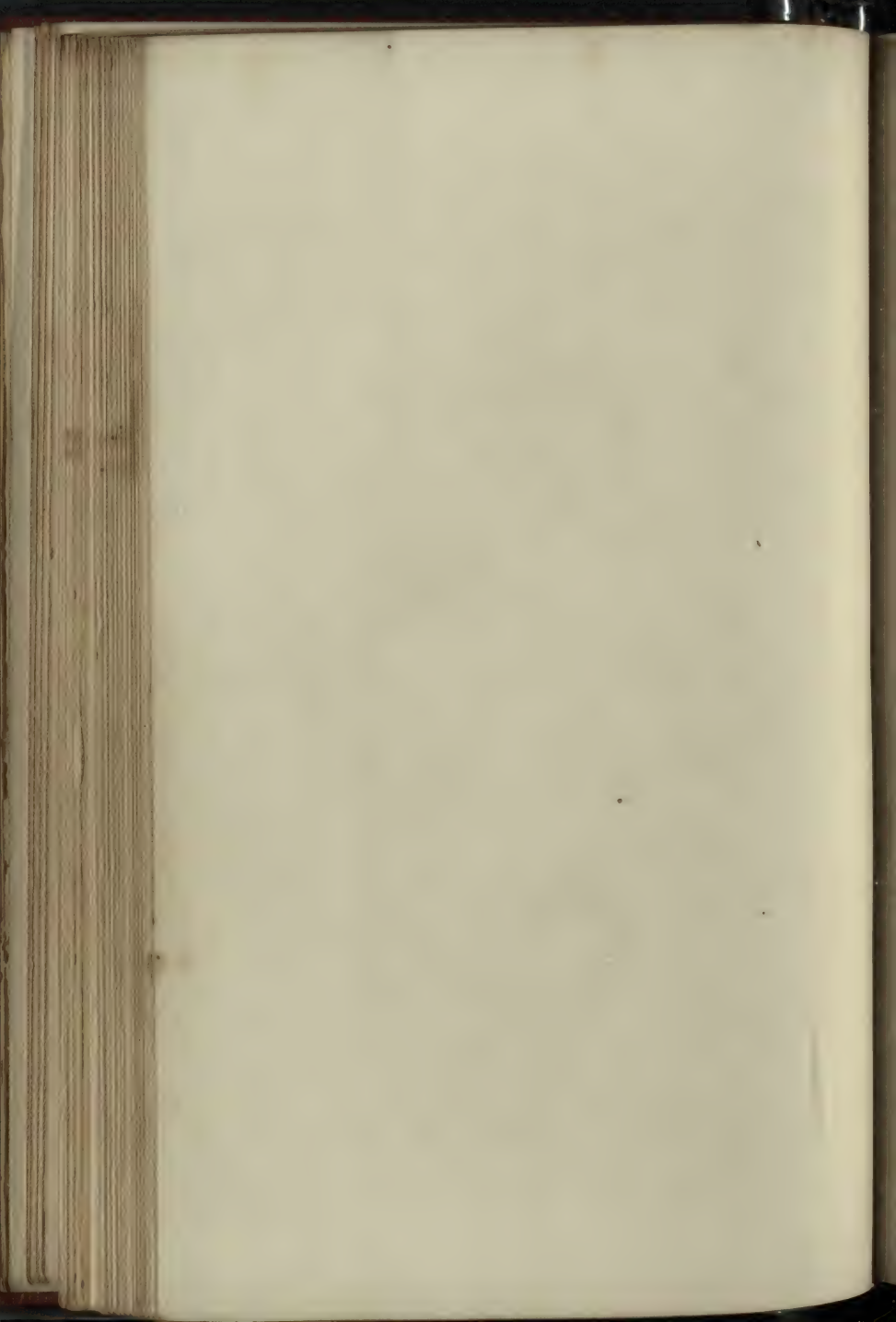


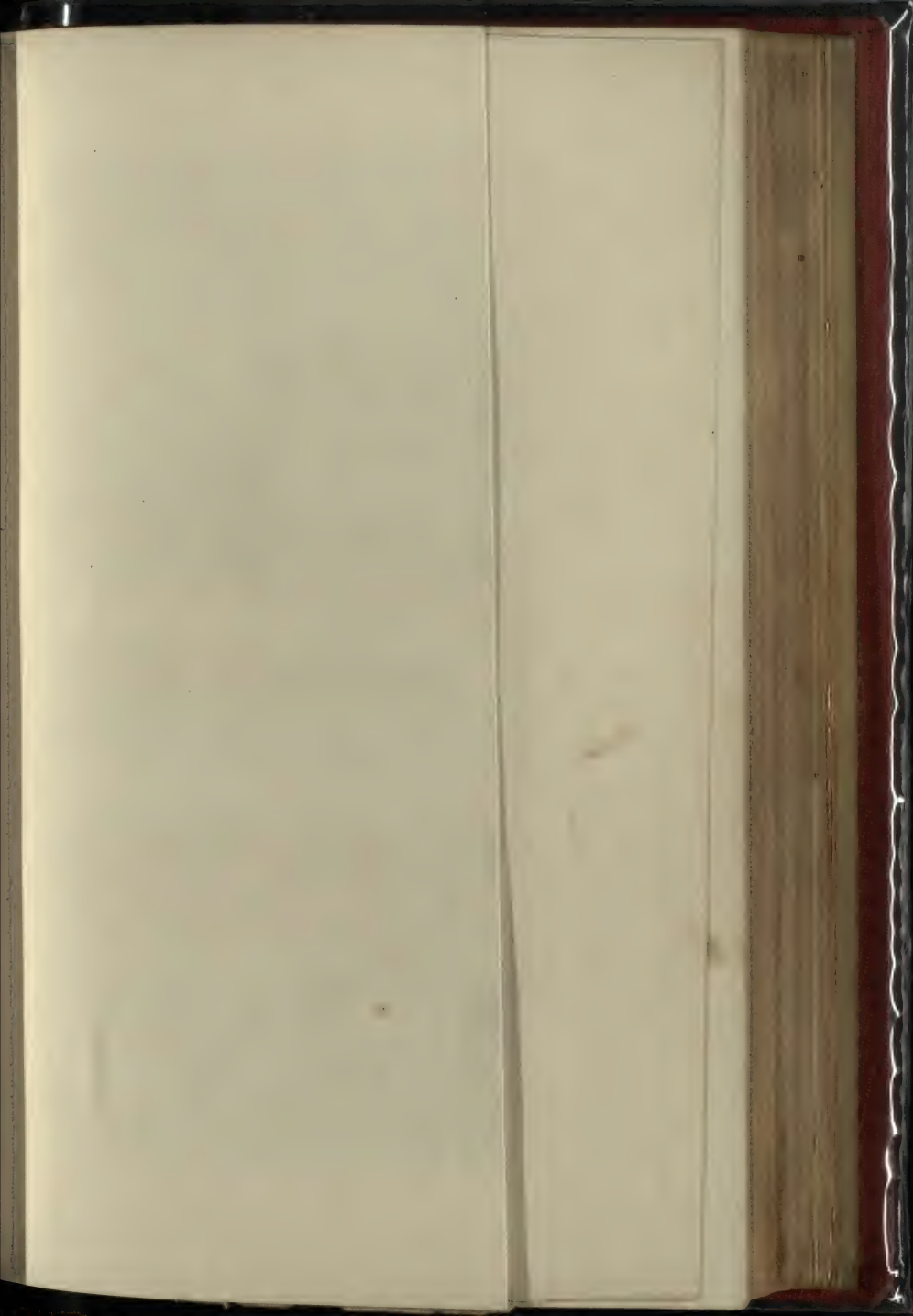






P. R. N. C. H. F. A. N.

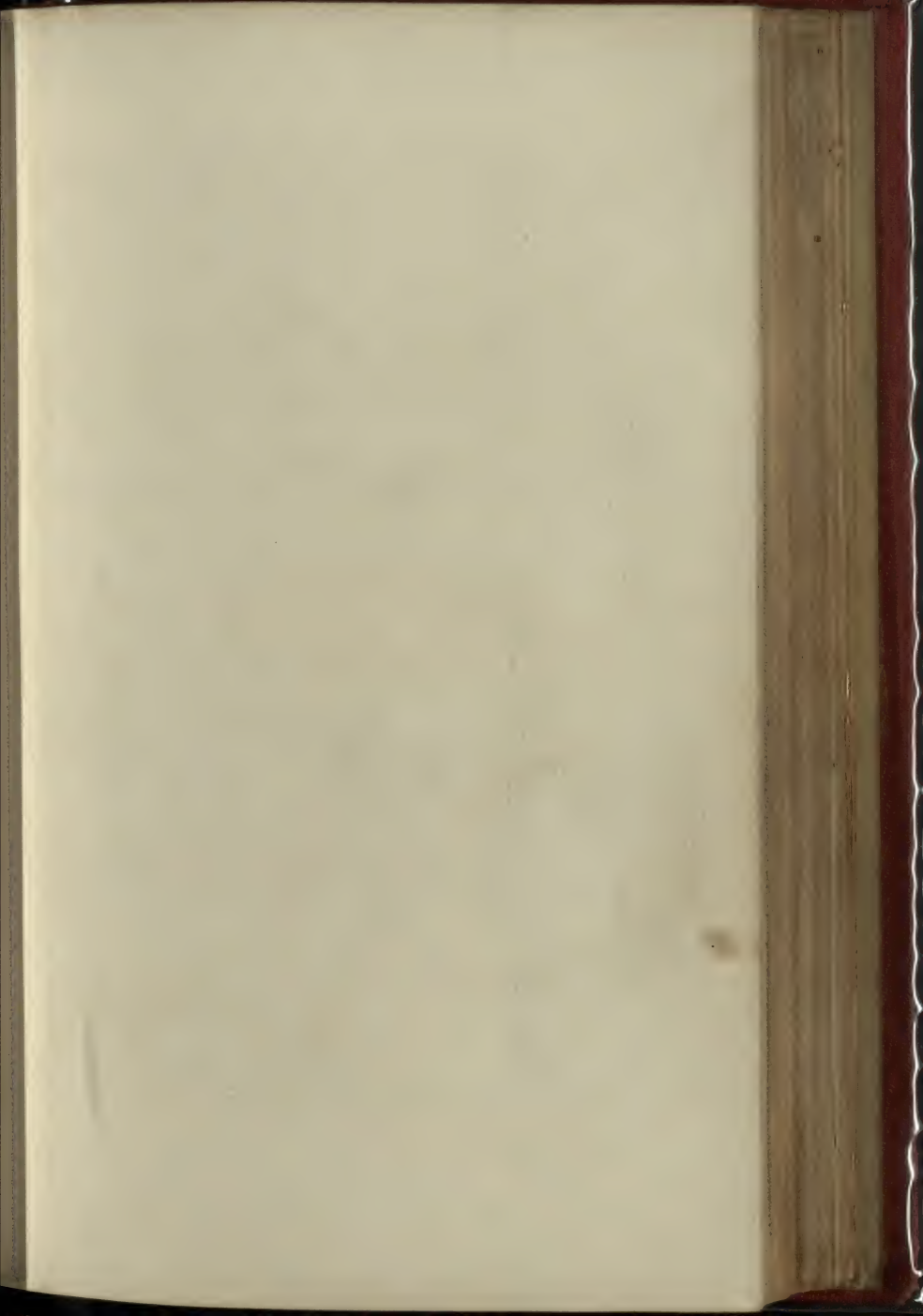






Engraved by C. D. Webb

NORTH TRANSEPT, GREAT EXHIBITION.





Engraved by G. Gesslbach from a Drawing by W. Robinson

GRAND COTTAGE PIANOFORTE

EXHIBITED & MANUFACTURED BY MOORE & CO.



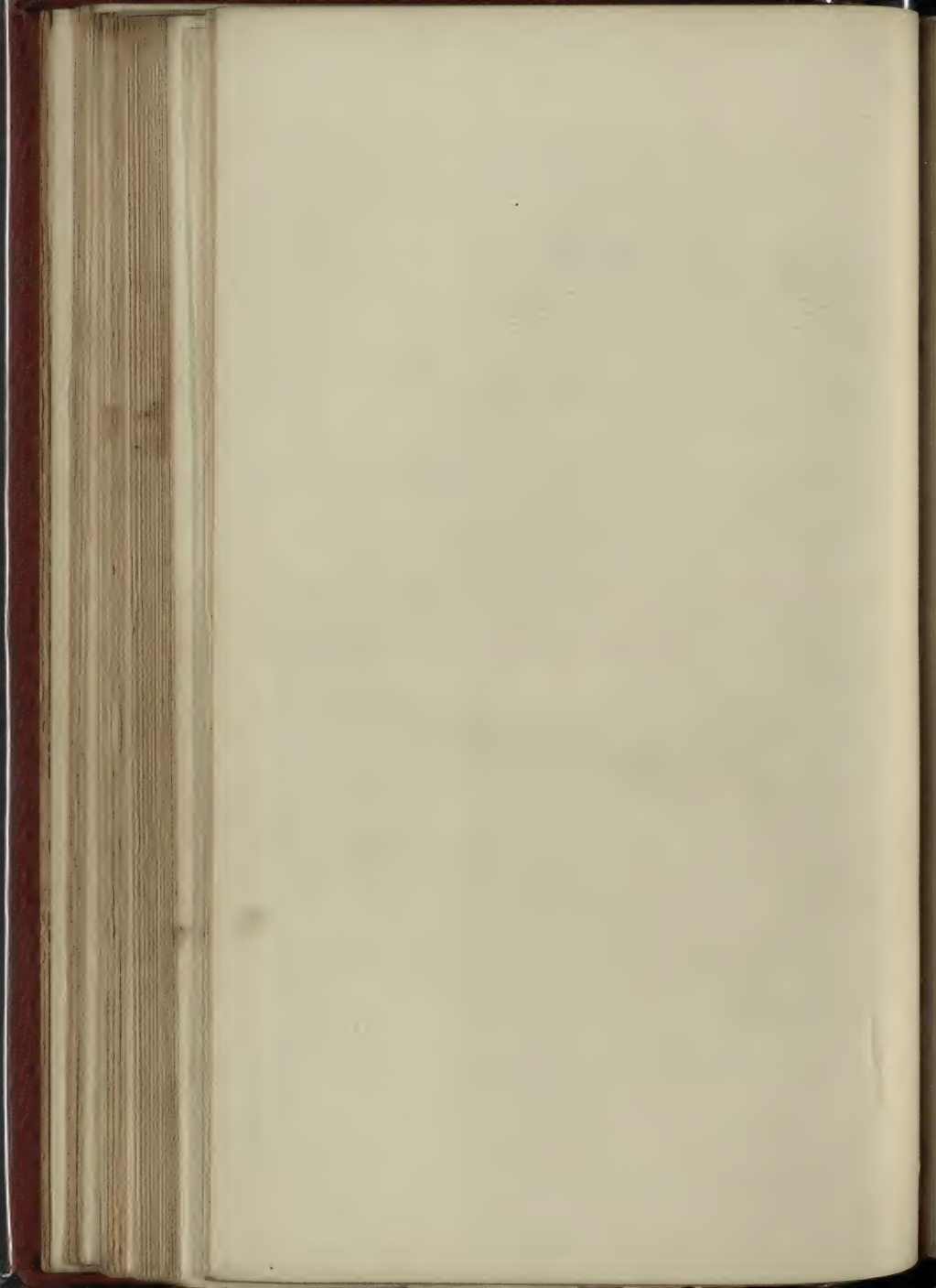


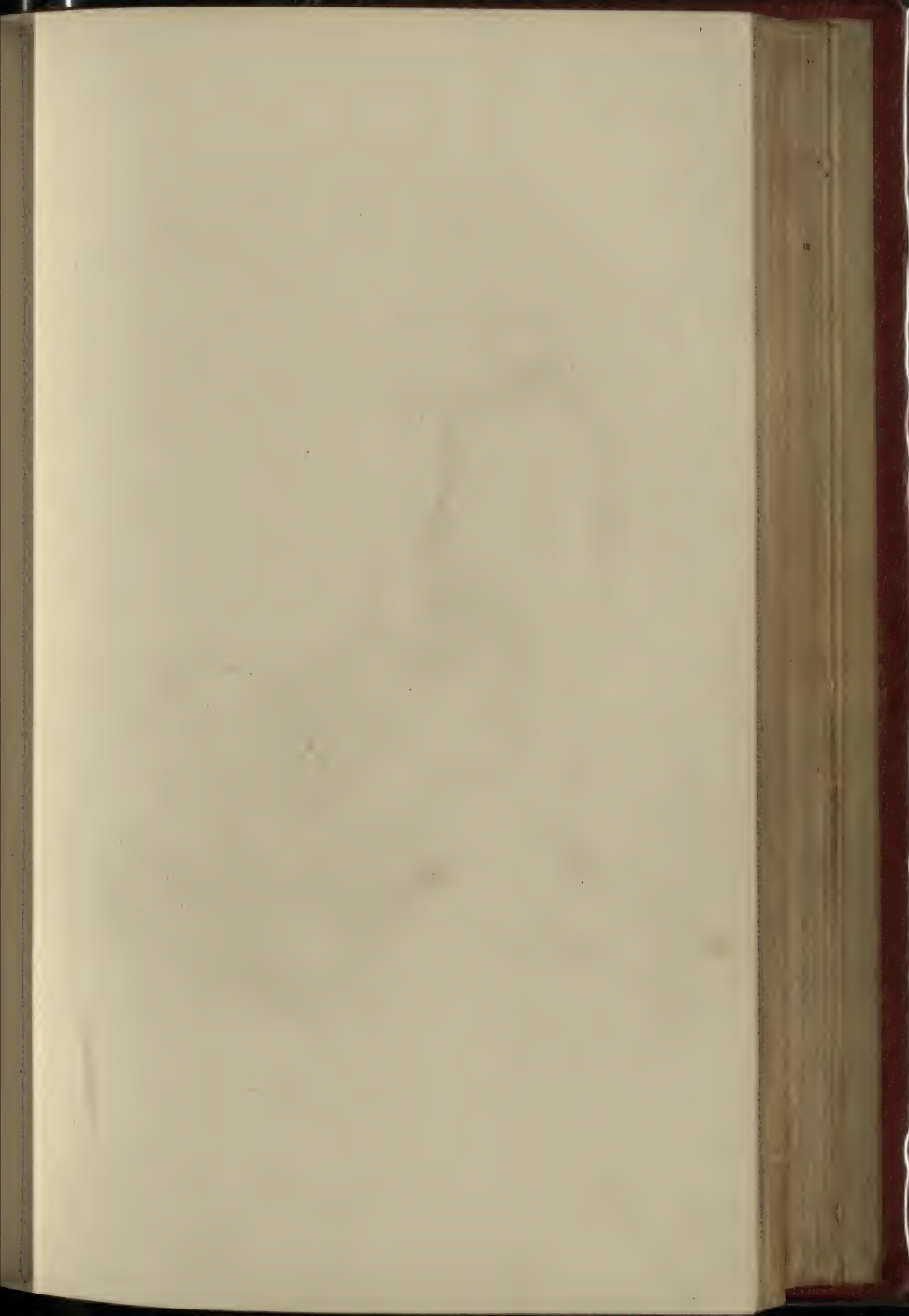


Design given by the artist, and executed by W. Collard.

PIANOFORTE

EXHIBITED & MANUFACTURED BY COLLARD & CO



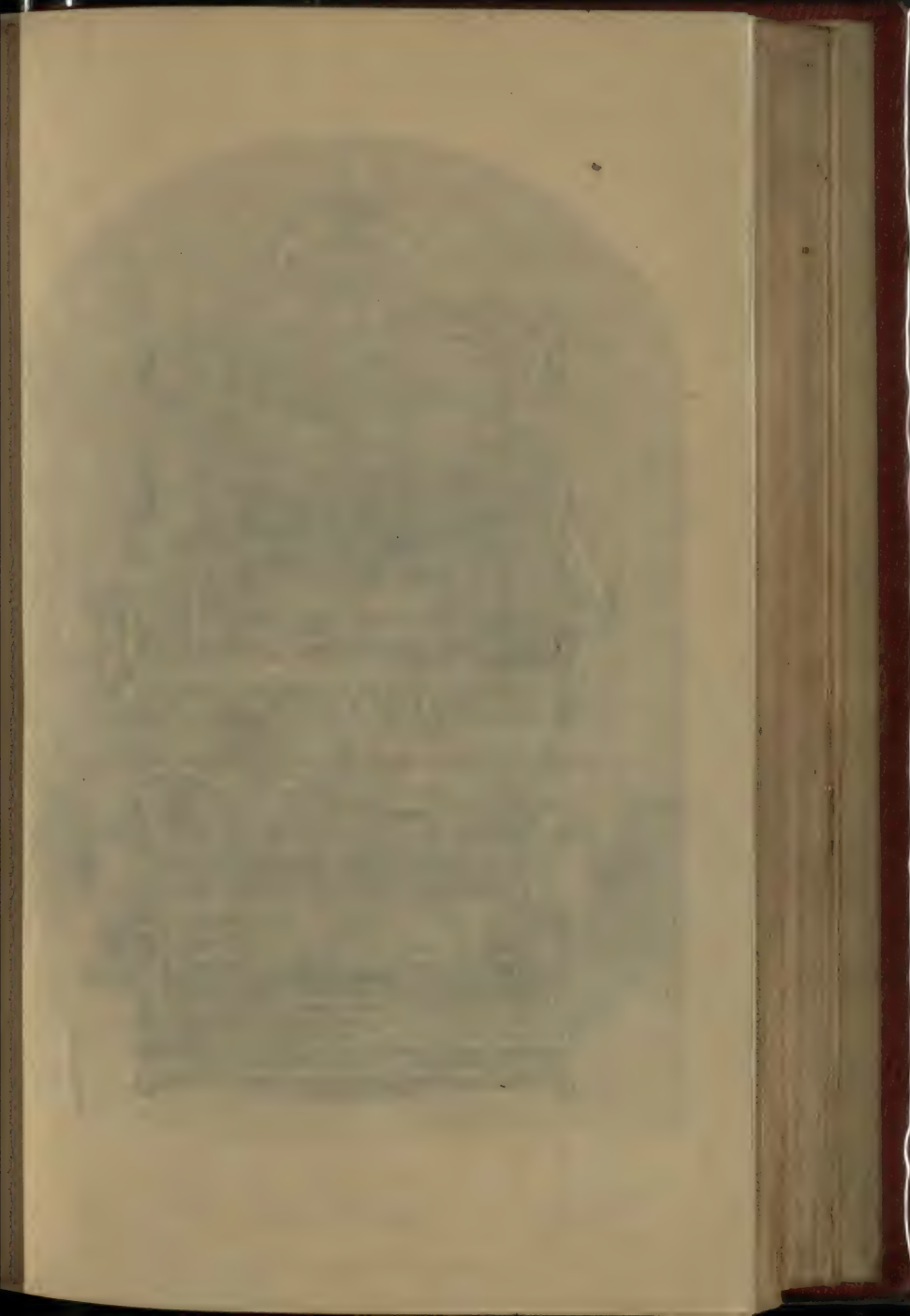


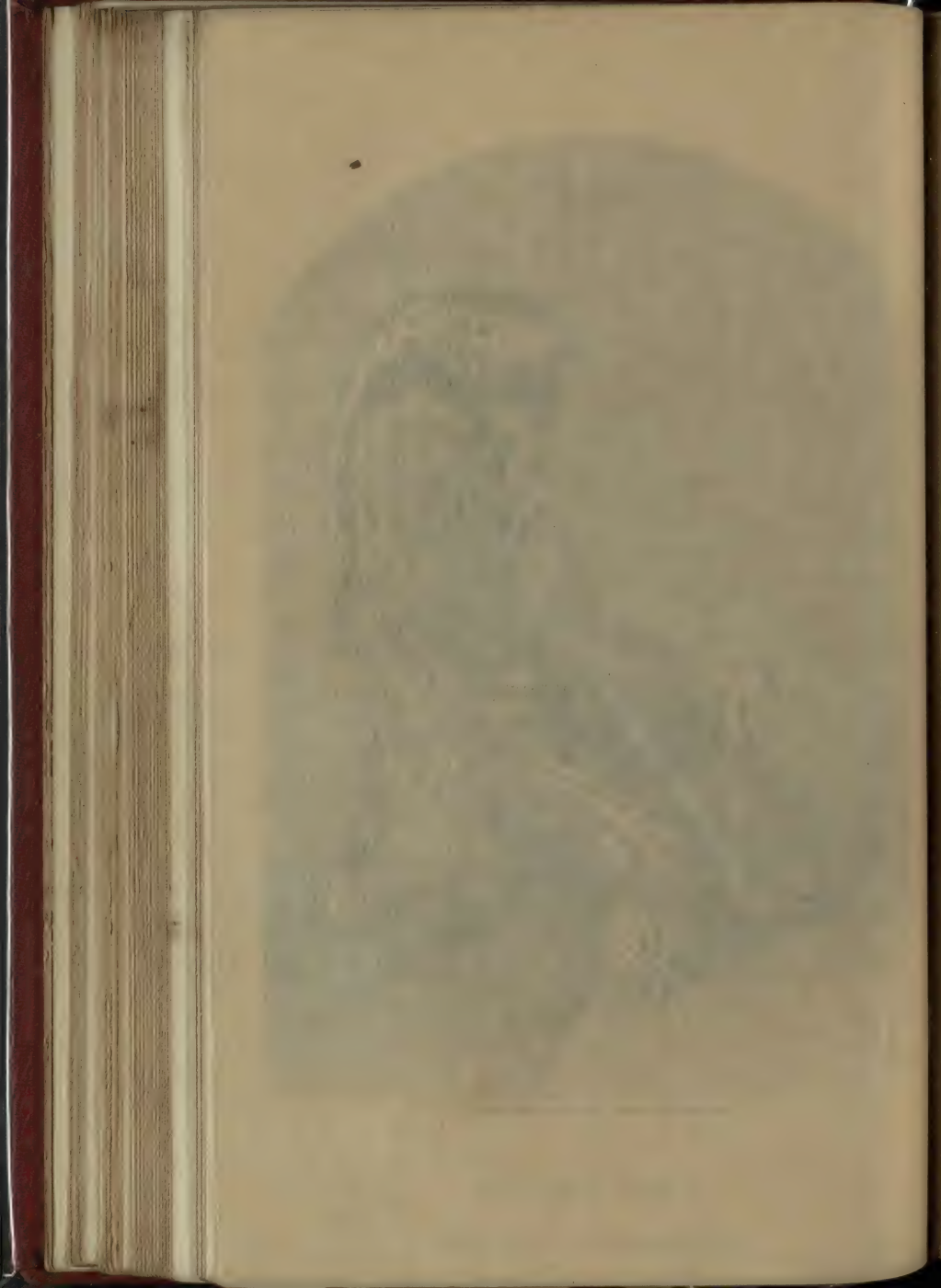


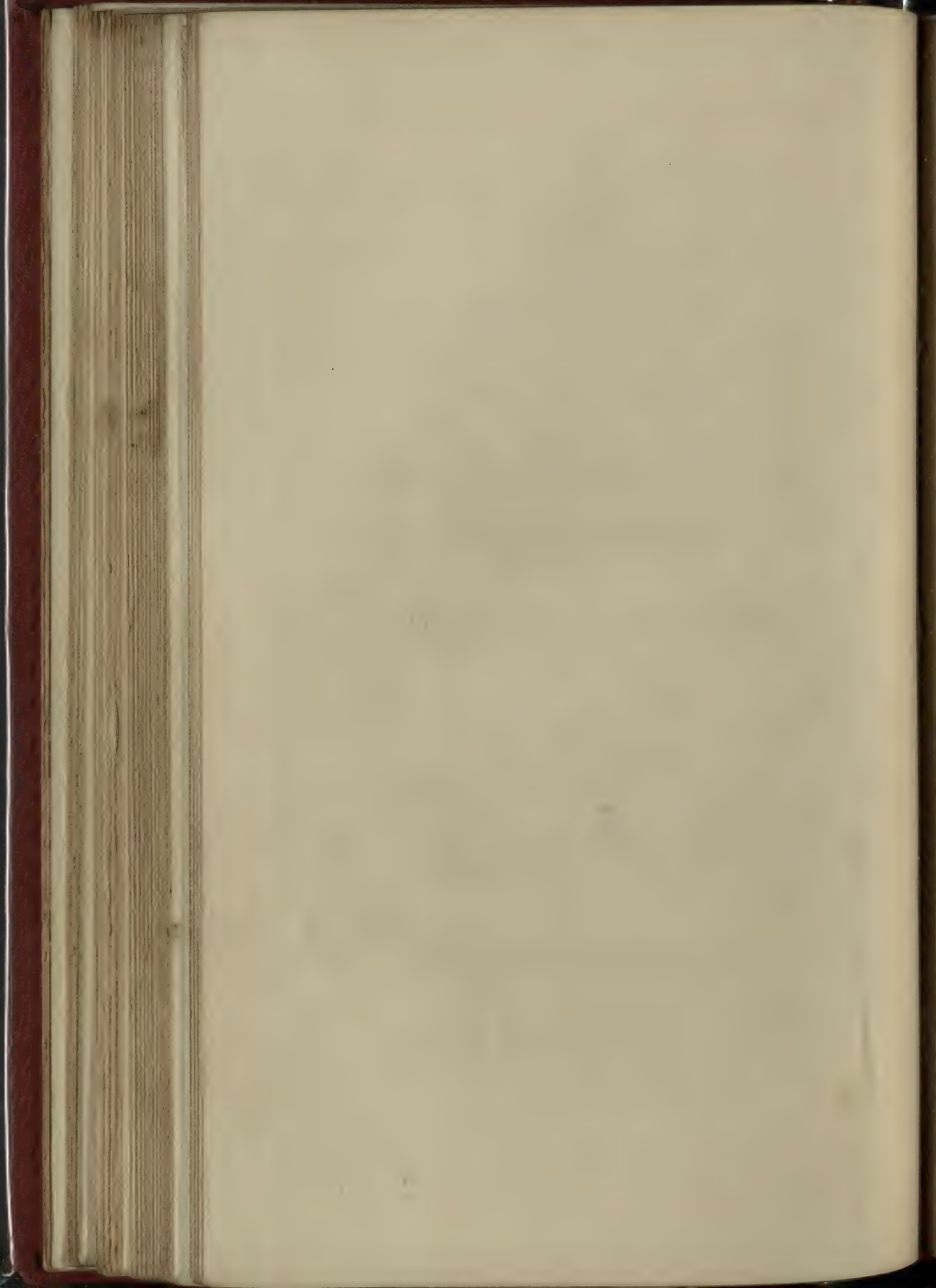
Engraved by C. G. Heath, from a Drawing by W. T. Johnson.

ORIENTAL CHAIR

MANUFACTURED BY JENNENS & BETTRIDGE







THE GREAT EXHIBITION.

CHAPTER I.

LETTERS OF M. BLANQUI—*concluded.*

LETTER VIII: AUSTRIA—IMPERIAL PRINTING OFFICE—MAPS—BOHEMIAN GLASS — THE CRYSTAL FOUNTAIN — AUSTRIAN TYRANNY. LETTER IX: LYONS—GREAT VARIETY AND RICHNESS OF ITS DISPLAY — GOLD CLOTH — CHURCH ORNAMENTS—CRAPES—CRAVATS—PORTRAITS WOVEN IN SILK—TASTE OF THE LYONNESE. LETTER X: MULHOUSE—MUSLINS, JACCONETS, ETC.—BRILLIANT DYES—ENGLISH AND FOREIGN FACTORIES COMPARED—MACHINERY VERSUS WORKMEN—GOLD AND SILVER WORKMANSHIP — ENGLISH AND FRENCH COMPARED—VARIOUS STYLES DESCRIBED—BRONZE CHASING.

LET us now once more turn to the agreeable lucubrations of our learned friend, M. Blanqui.—I cease for a while, he writes, my studies upon French industry, in order to treat of Austria and her exhibition. Austria occupies the third rank of this universal congress; and she has appeared with a display of resources which has surprised the whole world, except those who do not form their opinion from public report, and who do not judge of great states from pot-house prejudices. Austria has taken the Exhibition in earnest. She has appeared armed at all points, and every day the interest excited by her various products, which betoken an industrial progress worthy of the attention of manufacturing nations, is increasing. Commencing with the most liberal branch of industry—printing—I am glad to say, that the imperial printing-office of Vienna has exhibited the most complete collection of specimens of all known types. This collection,

which contains no less than two hundred and six languages or dialects, from Phœnician characters, the most ancient in the world, down to Japanese, is the most beautiful in Europe. It is of itself a sufficient answer to the charge of love of darkness, so often brought against Austria, and which for a long time has only been deserved by her new government.

Austria has now entered upon a new path, and although the statue of Marshal Radetzki, which seems to watch, leaning on a sword, over the deposits of Austrian wealth, may appear an emblem little in conformity with the industrial progress of that country, there is no other, after France and England, which merits in the same degree the attention of the man of study and of labour. The homage rendered to science and to human intellect by the branch of industry most capable of propagating them throughout the world, is assuredly a remarkable fact. When we reflect upon the immense quantity of linguists, of professors, of compositors, and of able workmen, which such a luxury of typography evinces, it will suffice to show the rank occupied by Austria in the great European family. The imperial establishment of Vienna possesses all the types of the characters printed in its workshops, and it has even exhibited the matrices used in their manufacture. The ingenious invention, by means of which the 80,000 signs of the Chinese language are formed by moveable type like music, has been particularly noticed. In a technical point of view, the art which the Austrians have attained of calculating the space occupied by every isolated letter, enables them beforehand to know what will be the precise extent of a manuscript when it is printed, and the imperial printing-office possesses already 150 millions of letters founded upon this system. Oriental scholars have greatly admired a work printed for the first time in Japanese with moveable types, and which, from its perfection, would rather appear to have been imported from that country itself, than reproduced in Germany. Austrian typography has placed itself in the first rank, through

this magnificent display of richness. It would require a volume to give the simple catalogue of all she has exhibited of this nature, and that volume would require a knowledge of the subject which I do not possess. I regret to say that the national printing establishment of France has limited itself by opposing to this dazzling array of typographical productions a solitary volume of specimens, which have unquestionably their merit, but which do not seriously represent French typography.

Austria has also displayed much luxury in her topographical productions, and her maps, already very celebrated, have maintained at the Exhibition the distinguished rank which they merit. When we leave the department of science to enter into that of the industrial arts, we find that Austria is making sensible and continuous progress. She manufactures iron skilfully in her works of Styria, the products of which are excellent. She has almost supplanted the town of Nîmes in the exportation of common shawls. She manufactures with great superiority ordinary woollen cloths; and, notwithstanding the legitimate reproaches which may be addressed to her on the subject of taste, her furniture has produced a certain degree of sensation at the Exhibition, owing to the spirit with which it has been executed. A country which manufactures as many as eight millions of scythes and reaping-hooks for exportation only, is evidently organised for extensive industrial pursuits. But it is especially in Bohemian glass that we recognise one of the most marked superiorities of Austrian manufacture; and this is the place to say a word about the condition of the glass manufacture as shown at the Exhibition. Three powers had the right to figure there with their distinctive characteristics—France, England, and Austria. France has abstained from exhibiting. Our beautiful manufactories of St. Louis and of Baccarat, managed by protectionists as skilful as they are bigoted, have sent nothing, whereas they might have sent masterpieces, which are perfectly well known, for there is a magnificent collection of

them at the Conservatoire des Arts et Métiers, at Paris. We do not even hesitate to say, notwithstanding the ill-feeling of these gentlemen, that this collection would have sufficed to beat out of the field all the rival collections; but then, at the same time that we should have demonstrated the superiority of the French glass manufacture, we should have asked with what right it dared to levy tribute on the national consumers, and show itself so eager for monopoly, with which it can dispense exceedingly well? This is what their absence will not prevent us from asking. Besides that this absence is a grave fault at a moment when the question is to defend the honour of national labour, it is likewise a useless precaution, because the object of this intentional desertion will escape nobody. It is shameful to hide yourselves when you are accountable to your country for the efforts which it has so liberally made to sustain you, and you lose all right to boast of your superiority when you refuse to appear at a gathering like that of London. Away then, gentlemen, with your pretensions to prohibit in France the entry of the glass of Bohemia and of other countries! Away, shameful tax-gatherers, who levy upon us, by means of prohibition, abusive imposts; and who do not wish any one to discuss the strange budget by virtue of which you make us pay so dearly for what we ought to have cheaply! The moment is approaching when all producers will have to submit to the natural reign of competition. We will gladly make sacrifices for the state which guarantees to us security, roads, justice, or government; but what do you insure to us, shameless monopolists? Yes, here you would have shone beyond comparison, if not through the cheapness of your products, if not through their colour, at least through their form. You would have been recognised as worthy to occupy a medium situation between England and Austria. England seems to have gained the palm for white, Austria for coloured glass. The gigantic English fountain, upwards of thirty feet high, whose waters diffuse throughout the transept of the Crystal Palace a

delightful freshness, is a masterpiece which you have not equalled. The large pieces of red Bohemian glass, of which you feared the rivalry, have in reality over yours only the advantage of cheapness. You would have united nearly all the merit except that of sparing our purse. My learned colleague, Michel Chevalier, was right when he said, "France pays you the poor-rate, and she does not owe it you."

I was sadly afflicted to find under the Austrian flag the products of a considerable portion of Italy;—the silks of Milan, of Verona, the beautiful stained glass of Bertini, the mosaics—everything, in short, that is left of art and grace to these unfortunate Italians. Austria has exhibited very fine specimens of her mineralogical products. She shines less in her cotton goods, which she would do well to leave alone. It is now-a-days the error of great nations to desire to procure, at any price, by means of forced labour, that which they might acquire cheaply by means of their natural labour. The printed calicoes of Austria are very ugly, and badly finished, notwithstanding the abundance of chemical productions which are exhibited in her name. Chemical products have followed the progress of science in nearly all the countries of Europe, and as I find occasion to remark it here incidentally, I have obtained at Manchester authentic proofs of the remarkable change which has manifested itself in England. One of the most eminent calico printers has shown us by his books the price which he pays for various substances, all of which evince a very advanced state of manufacture. Upon the whole, Austria occupied a very distinguished rank in the Universal Exhibition. There is, in the almost encyclopædic collection of her products, something masculine and severe, characteristic of the nation itself—a dissimilitude in strength as there is a diversity of races in the empire. The Bohemians, the Hungarians, the Italians, the pure Germans, who have co-operated in forming the union of Austrian industry, have each unquestionably preserved their peculiar physiognomy, and have lost nothing

by being associated together. It will be hereafter interesting to study the special character of the labouring populations of all the countries which have appeared at this Great Exhibition—French, English, German, Spanish, American, and Oriental. You will see what curious relations exist between the workman and the work, and how much the lot of the former is connected with the success of the latter. But who, until now, has occupied himself to know exactly what is a workman? Workmen are flattered when they are strong—they are curbed when they abuse their strength; but to study them, to admonish them—who thinks of it.

LETTER IX.

I return, with the whole of Europe, to this marvellous exposition of Lyons, which will form an era in the history of industrial exhibitions. It is not sufficient merely to exclaim, like all the spectators, "Beautiful! magnificent! admirable!" it is necessary to enter into some details of this *event*, to analyze this catalogue of *chefs-d'œuvre*, and to attempt to make every one appreciate their import. The city of Lyons has not only outstripped all rival manufactories, if such there be—she has eclipsed herself; and you will be better enabled to judge of her strength from the simple fact, that only one-seventh of the Lyonnese manufacturers have presented themselves at the Exhibition; but these are the masters of the art. I have already told you that they had had the happy idea to lay aside their individualities for the purpose of appearing jointly. In truth, only one name is observed, that of the city of Lyons, which towers above all her products, and which appears to canopy them with her glorious renown. Union has constituted their strength, and these illustrious anonymous persons shine with a greater brilliancy than if they had posted up their own names. I could have wished that the Parisian furniture and paper-hanging manufacturers, imitating their example, had confined themselves to the following simple inscription: *Paris, Faubourg Saint Antoine.*

That would have meant, "You take us for barbarians who only know how to destroy; behold how we work when we are not engaged in setting the four corners of Europe in a flame." And Europe would have answered, "Pray work, gentlemen; it is a great deal more beautiful."

Let us commence by doing justice to the two men who have presided over this brilliant Lyonnese exhibition, and who watch over it in London with paternal solicitude. They are Messrs. Arlès Dufour, member of the Lyons jury, and M. Gamot, inspector of silks. The one, full of fire, zeal, and ardour, is not an inapt representative of the operative impetuosity; the other, calmer, milder, and more thoughtful, resembles the genius of business. A goodly portion of the success of the great city is attributable to them, and it required not less than their united merits to bring to a happy issue this memorable exhibition, the preparations for which have not been unaccompanied with difficulties. I will describe to you how they have accomplished the delicate task which had been confided to them. They have collected under one head all the Lyonnese articles of the same description, without distinction of origin, and they have exhibited them in the best light. Thus, all plain fabrics are exhibited together, from the lowest priced to the most costly qualities. The cut or crisped velvets come next, followed by lustrings, satins, and gros-de-Naples; then follow crapes, plushes, handkerchiefs, the figured and brocaded goods, and the fabrics used for churches and palaces. Every kind comprises all its varieties, and an attentive contemplation of the whole suffices to embrace, in the most complete manner, this immense family of woven fabrics which constitute the pride of the loom.

We were the less prepared to admire what we are about to describe, inasmuch as the Paris Exhibition of 1849 had left in the minds of all an unfavourable impression of insufficiency and sorrow. It was evident that the city of Lyons had not figured in a manner worthy of herself at this industrial solemnity, and that she bore profound traces

of the moral and political disorder caused by the events of 1848. I leave you to judge of the general surprise called forth at the aspect of the fabrics of incomparable richness and variety, which leave far behind them everything of the kind that has been attempted even in Lyons. Thus we may see, at the Crystal Palace, gold cloth with bouquets figured with silk, valued at 400 francs per metre, of workmanship so superior, that it may be considered as the most beautiful ever issued from the looms of Lyons.

Lyons has maintained and raised her old repute of her manufacture in fabrics for church ornaments, and in woven and embroidered chasubles, with inlaying of precious stones. The figured goods naturally occupy in the Lyonnese exhibition the most important place, owing to the special character of their manufacture, the richness of their colours, and the grand beauty of their ornaments. It is from thence that all court robes, the princely hangings, and the decorations of the most splendid apartments, are sent forth. It will be a long time before we behold a more glorious industrial trophy than that of all these glorious evening dresses chosen among the *chefs-d'œuvre* of the loom, which represent the greatest difficulties overcome, together with the most delicate and most exquisite effects of pattern and mixture. There is not a nation in the world at present capable of uniting in the same degree the richness of material with the perfection of labour.

Only one house has exhibited crapes—about seventy pieces—crisped crape, smooth crape, crêpe-lisse, *aerophane* crape, embroidered on white or in colours, of indescribable grace, lightness, and freshness. This department of the Exhibition is very dangerous for husbands. From morning till evening there are thousands of women in ecstasy, who laud them to the skies. It is, indeed, from the heavenly regions that these enchanting productions, variegated with a thousand colours, transparent and light, like the wings of the butterfly, would appear to have descended. Happy women of the earth! I cannot too often repeat it to you: when you throw over your beautiful shoulders these aerial

scarfs, think sometimes of the poor girls who have made them. They are of your own sex, your own country, and your own religion; and they are often in want of the necessities of life, after having provided you with superfluities! Not far from these treasures, the Lyonnese have exhibited an assortment of more than 200 pieces of cravats, neckerchiefs and handkerchiefs—more durable and vulgar, but of which immense quantities are produced, and in the manufacture of which the Lyonnese industry has made considerable progress in the last fifteen years. Lyons has not excited less public attention by her three stalls of black plush for men's hats. Hats, such as are worn now-a-days in the shape of perfectly ridiculous cylinders, are very ugly, ungraceful, and incommodious; but they are not too dear; and it is owing to the improvements introduced in the manufacture of plush that we are enabled to renew them often and have them clean, until we wait that a form more rational and more appropriate to our habits be given to them.

There is, in the Lyonnese exhibition, an article which it would be well to leave alone; these are the plain fabrics, with patterns printed in the warp, called *chines*, which have become very fashionable of late, though they but little deserve it. This bastard or misty style, very extensively used for ladies' dresses, imparts to the pattern something vague and stiff, which is contrary to the traditions of Lyonnese manufacture, so justly celebrated for the brilliancy and distinctness of its colours.

Only one exhibitor has dared to compete with the Chinese crape shawls, and he has done wisely. The real China crape shawls are always a little heavy in their embroidery, even when the fabric upon which they are worked, which is seldom the case, is light. We may, therefore, attempt, with hopes of success, a competition which deserves encouragement. I may say the same of the special manufacture of silk cravats, in which the English excel to a degree to send a good many to the Parisian market. The watered silks exhibited are somewhat stiff,

and are particularly suited to dowagers. There is another description exhibited, more rich than beautiful, and which is relieved, I might almost say inlaid, with gold and silver. The use of filigree wrought metals is only suited to the habits of the East. The Lyonnese shawls are going out of fashion, or are transformed, beaten out of the field, by the Parisian manufacture in point of elegance and materials, beaten by the printed shawls in point of economy, and by the fashion which is by degrees substituting the wrapper, the mantles, and wadded over-dresses, to everything that is not an Indian shawl. Lyons has exhibited figured shawls all of silk, and velvet shawls, for this winter, very graceful and elegant. This is the inimitable stamp of Lyonnese manufacture, distinction, and elegance. I trust our English neighbours will pardon me, but all the printed shawls—real slop shawls—of which their women use such lavish quantities, would not be worn in Paris by respectable chamber-maids. It is with difficulty that such houses as M. Depouilly of Puteaux, Messrs. Gros, Odier, and Roman, of Wesserling, whose products are perfection itself, can obtain for their printed shawls a sale much more due to their lightness than to the purity of their printing. I shall only allude incidentally to a compliment paid to the royal family of England by the house of Potten and Rambord, consisting of three pictures, worked in silk by the loom, by the process of Maissiat, after Winterhalter, representing Queen Victoria, Prince Albert, and one of their children. There is also a portrait of the Pope, executed by the same process, from the manufactory of M. Coquillat. These pictures from the loom are veritable triumphs, which only tend to prove of what the shuttle is capable; but I do not admire them any more than the Gobelins pictures, which will never be industrial products, and which will always leave something to be desired as works of art.

That which, above all things, distinguishes the Lyonnese manufactures, is the supreme taste which characterises all its productions, like the natural element in which its work-

men breathe; it is that series of traditions which neither the revolutions of fashion, the devastations of civil war, nor the savage distractions of politics, have been able to interrupt. There would appear to be a mysterious agreement among the innumerable hands which co-operate often, without knowing each other, in the perfection of these admirable fabrics. Warpers, designers, finishers, dyers—all lend each other, without effect and almost without method, mutual assistance. They produce masterpieces in the same manner as elsewhere vulgar things are produced, because it is their nature. Behold them at work: with what care they protect against the dust of the domestic hearth the immaculate whiteness of these satins, purer than silver—or of those crapes, the grain of which is produced by the pressure of a cylinder, covered with coarse leather, and rough to the touch! Nothing will be more interesting than the history of these men, when it shall be written with sympathy for them, without flattering or disregarding them. These men, at the present moment, demand their proper position; and they exhibit, as their title-deeds, the masterpieces which we have just admired. Have they deserved it or not?

LETTER X.

After the striking success of the Lyonnese exhibition, there is none comparable with that of the manufacturers of Mulhouse, who have also had the happy idea of appearing collectively, and whose products have excited universal admiration. Here, it is no longer by the richness of the material that the exhibitors have shown; it is by the elegance of their patterns, and, above all, by their splendid execution. Muslins, jacconets printed for gowns, printed cloths for curtains and furniture—these constitute the general staple of the Alsatian exhibition; but, with these simple articles, they have found the means of eclipsing all rival manufactures, and they no longer fear any competition. I do not think that I am unjust towards any one by asserting that the manufactures of Alsatia are the first

of France, either as regards the importance of their own capitals, or those of the bankers who are interested in their operations. They have all taken manufacturing pursuits in good earnest, and do not devote themselves to them, like so many others, to make a small fortune, and then to retire into idleness. They live or die engaged in industrial avocations. The manufactories pass from father to son, constantly perfected by the intelligence of generations which succeed each other. At Mulhouse they study—they do not vegetate in the beaten track of routine; there are industrial and scientific societies which endeavour every day to solve the economical problems of manufacturing labour, and which generally conduce to them by the most liberal means. What a difference from the exclusive, absolute, and prohibitory manufacturers of the north! able men likewise, but untractable, and ever ready to regard their local interests as those of the whole of France. Alsatian industry was therefore destined to shine at the London gathering, and it must be admitted that it makes a better figure than that of Turcoing, Lille, and Roubaix, although these are represented by very honourable names, among which those of Messrs. Scrive, Frères, are foremost. Alsatia is a model manufacturing country. Machine manufactories, spinning, weaving, printing establishments—all are united there; it is the land of mechanists, designers, and chemists. Every especial degree of skilfulness lends each other a mutual aid, and hence there has resulted an *ensemble* of forces which has turned to the profit of their entire manufacturing system, and which attracts towards it, by preference, the attention of the manufacturing world. It is sufficient to name the Koechlings, the Hartmanns, the Dillfus, the Schlumbergers, the Zubers—all these really patrician families—to justify this well-merited preference. It is to Alsatia that the immense development which calico printing has taken in Europe during the last twenty-five years is owing; it is Alsatia which has spread the best modes of manufacture, and which unceasingly perfects them. Nowhere better than in this land

are dye-stuffs more skilfully used; nowhere are dyers' weeds, madder, cochineal, and orchilla, applied with more brilliancy or fastness. Alsatia is like a great printing school, where the masters and foremen of all nations come to form themselves. It is, thanks to her, that Europe has become partial to those graceful and light fabrics which now-a-days decorate at such small cost all dwellings, and which so economically clothe all women. The exhibition of these masters of the art was therefore expected with impatient curiosity. It has been worthy of them in every respect, and their products have become the standard by which all other analogous products are compared, to class them suitably. It is, therefore, well to state, that all the calico printers of Europe are unanimous in admitting that Mulhouse carried off the palm over all printed calicoes, as Lyons did over all silks. This superiority is easier to state than to define. The English are great producers of printed calicoes; the Belgians, the Austrians, the Prussians, the Saxons, the Spaniards, and even the Turks, are so likewise; but, with the exception of two or three Manchester houses, all these manufacturers belong rather to the school of Rouen than to that of Mulhouse. The calicoes which they print are very ordinary, and cannot compete with ours. It is through the immense quantities which they produce, as well as the economy in the details, that the English are distinguished above all other nations engaged, like them, in calico printing. Their great advantage consists in operating upon enormous masses of goods, and not to waste an atom of matter. You should see with what solicitude they seek after economising a centime on a chemical product, on a number of yarn, on a colouring matter, and on freight; and with what art they transform this economy into profit, by millions, by multiplying their markets by demand, and demand by cheapness. This art is pushed in England to the most microscopic details, and veritable oceans of wealth are created there literally drop by drop.

Thus, all their factories have a severe and somewhat

gloomy aspect of grandeur and simplicity. Not a single ornament—no columns, no architectural display. High and black brick walls, iron flooring, iron stairs, iron doors, iron barriers everywhere—rarely flowers and trees around a factory—never any fruit-trees. The abodes of labour, it must be admitted, are not very cheerful in England. In France, on the contrary, and particularly in Alsatia and Normandy, the factories have nearly everywhere an attractive appearance, full of charm. They are inhabited often nearly during the whole year by their proprietors; they are surrounded with gardens, or faced by beautiful avenues, or bordered by beautiful waters; and their more artistic character is more in unison with their destination, and with French habits. I shall never forget, as one of the noblest specimens of the kind, the beautiful factory of Messrs. Zuber at Rixheim, near Mulhouse, with its large spacious courts, shaded by magnificent sycamore trees, looking more like an Italian villa than a manufactory of paper-hangings. More not less remarkable instances might be quoted at Thann and Cemay. It is, therefore, always by means of art and taste that we distinguish ourselves, and that we compete with our rivals. They shine with the compass—we with the pencil. They derive their profit from fuel, from iron, from the mass of the products manufactured, from the greater facilities of credit amongst them; our profits are derived from our designs, from our inventions in matter of colour and form. They *force* the buyers by lowness of price—we seduce them by novelty. The prosperity of an English factory depends more on its master; that of a French factory more on its workmen.

It is evident that everywhere, where it is only necessary that machinery, almost perfect, such as those English looms of 1,200 spindles—monster machines, which move by themselves, which go, come, I might almost say, which reason—should work regularly, the capitalist and the mechanic alone suffice; but when the success of the manufactory depends upon the designers, the chemists, the finishers, the wealth of the master can do nothing; the

genius of the workmen can do nearly everything. It is this value of the workmen which political economists have called their *moral capital*—infinitely greater in France than anywhere else. Thus, the magnificent sideboard executed by Fourdinois, and which has produced such a great sensation at the London Exhibition, has sprung from the brain of an able designer, M. Protat, whose name does not even appear in the catalogue.

The London Exhibition, and the study of the French and English factories, point out in a very significant manner the difference in the industrial genius of the two nations. We have just described the difference in the construction, in the site, and in the objects surrounding the factories; but it is still more striking, when you enter the workshops, to study the distinctive character of the two races. The English factory operative is cold, silent, absorbed by his task; he possesses a peculiar characteristic of patient and severe firmness, which distinguishes him from other workmen even in his own country. The French workman, on the other hand, more lively, more sprightly, more open, likes to chat, and indulges in it willingly whenever the din of machinery does not drown his voice. The English workman lives more isolated, he is more fond of privacy; he prefers domestic life when he has a family. The Frenchman is more fond of living in public, of noise, and of political discussions. The English workman does not seek after the public journals with the same eagerness as the French artisan. The influences by which both races are surrounded must also be accounted for in their characters. The French, accustomed from early life to the study of arts, of design, and the sight of monuments of art; the English more accustomed to the management of machinery and its various applications. Whatever degree of superiority the severe habits of the English may impart to their manufactures, the Alsatian, more than any other branch of French industry, tends to deprive them of it, because it unites with the advantages of internal economical order, the merits of numerous arts which add value

without enhancing the price of the products. It is not the richness of the material which constitutes the price of printed calicoes—it is the taste, the originality of the design, the happy combination of colours; all superiorities of French genius, which compensate, by a species of natural favour, for the elements of inferiority which we may possess.

The same contrast is found in a very different branch of industry now in process of undergoing a complete revolution, and split in two very different camps. I allude to artistical and industrial gold and silversmith's work. Garrard in London, and M. Odier in Paris, represented industrial; M. Rudolfs, M. Morel, M. Froment-Meurice, the artistic branch. Which of these is in the right? which in the wrong? Which of them works in the well-understood interests of production? How are we to establish an equitable comparison between such opposite styles? The gold and silversmith's craft has attained in these days such a degree of importance, that the question will not be easy to decide in the midst of the universal jury. Thus the English are still inspired by the ample forms of the age of Louis XIV., whilst in France they have long since studied to imitate the Grecian and the Roman. The English prefer the useful and the comfortable to be affected, to the bastard imitations of a revival, the originality of which too often consists in changing white into black, and to give to silver the colour of iron.

We have seen too many masses of articles of this kind, at the London Exhibition; fantastical groups of doubtful utility, and better calculated to figure in a cabinet of curiosities than on a well-served table. What signify these silver palm trees, these gentlemen on horseback, these allegorical and hieroglyphical figures, and all these whimsical compositions with which English workers in precious metals have inundated the Exhibition? Nothing but a dangerous departure from the path of taste, capable of driving the entire branch of industry into a false path, and drying up the source of its markets. I prefer the manly

and proud simplicity of Odio. Odio, the gold and silversmith, has produced gold and silversmiths' work. All his productions are destined for the use and service of the table. His candelabra, elegant as they are, are made to carry candles; his soup-tureens to contain soup, his coffee-pots to pour out coffee. You have only to place a bottle of champagne, surrounded by ice, in his wine-coolers, made of pure and simple silver—not forced, not contorted, not oxidised at considerable expense. Thus the famous Germain covered with his magnificent works the tables and the dressing-tables of Louis XIV. at Versailles. By the side of these principal pieces, where the perfection of the work vies with the richness of the material, the branch of industry of electro-silvering and gilding, of which the head-quarters at Paris are at Messrs. Christoffle and Co.'s, has made its appearance at the Universal Exhibition, and has attracted a great number of visitors. It arrived late, but it has regained lost time by a skilful display, and brilliant and varied, which will ever stand in the same relation to gold and silversmiths' work, as cotton lace does to thread lace, but without damaging the former, or destroying the taste for it. Elkington's process is still in its infancy. The immense metallic movement of California and Russia is destined to give it a new impulse, and I am convinced that ere long the keys of our furniture, a considerable portion of our table cutlery, our hunting weapons, and the locks of our apartments, will be gilt by this process.

France and England have exhibited gold and silversmiths' work of an immense amount. Several makers have contributed to the value of £40,000, some for £20,000, others for £10,000. I know not who will buy these Napoleons, these Wellingtons on horseback, these towers of Babel, these infidel slayers, these tigers, these wolves and lions, of gold and silver, which are of no use. It appears to me that bronze is better adapted than the precious metals for purely artistical groups. Bronze is firmer and more severe, and it has become so flexible in the hands of Parisian workmen, that its chasing is even superior to that of

gold and silver. It is in the industry of bronzes that the alliance of taste, of form, and imagination, has been most admired. This branch of industry is growing every day, and its importance will gain much from the comparison with the bronzes from the remainder of Europe, such as they have appeared at the Exhibition.

CHAPTER II.

EUROPEAN WORKMEN JUDGED BY THEIR WORKS IN THE GREAT EXHIBITION — NATIONAL CHARACTER DISPLAYED — A CONGRESS OF WORKMEN SUGGESTED — THE ENGLISH WORKMAN — THE FRENCH WORKMAN — THE GERMAN WORKMAN — THE SPANISH WORKMAN — INDIAN HANDICRAFTS.

As in our preceding chapter several references are made to the WORKMEN whose various labours adorned the numerous departments of the Great Exhibition, we shall sum up the notices of our Parisian Mentor with the following article from his talented pen, on the comparative merits, peculiarities, condition, and mode of thinking and living of the different workmen of Europe. Amidst the marvels of the Universal Exhibition, says our author, the idea has frequently suggested itself to me, to cast a glance at the condition and the habits of the workpeople who, in reality, have done the honours of it, and to endeavour to seek out if some mysterious relations did not exist between them and their works. In what consist these relations? Why has each country a distinctive characteristic of national originality, to such a degree that furniture, arms, lace, and woven fabrics, but seldom resemble each other in Paris, in London, in Vienna, and in Madrid? Why are Spanish workmen so gay, so lively, and so sober, and those of England so profoundly serious, silent, and voracious? Has not French

petulancy some connexion with the boldness of good taste of the French artisan, and Germanic coldness with the conscientious but heavy work of the German one? By means of what inexplicable prodigy do the workmen of India manufacture shawls more beautiful than those of Paris, and what is the unknown source of that school of designers which in the East seems every day to outstrip the limits of fancy?

I have greatly regretted that advantage has not been taken of the Exhibition to unite in a congress, in the midst of their works, workmen of all nations. They might have interchanged amongst each other, to their mutual instruction, a host of practical ideas and ingenious processes, which would have become the inheritance of the general industry of the world. In default of this cosmopolitan gathering, it will not be without interest to sketch the peculiar characteristics of the principal labouring families, whose productions have been displayed at the Exhibition, and to bestow a rapid and impartial glance upon their present condition. These large masses of men have, since the commencement of the present century, acquired an importance, and in some parts of Europe an influence so considerable, that it becomes imperatively necessary to study, in the closest manner, everything connected with their economic and social condition. The abolished system of guilds maintains still greater sway than is generally imagined amongst the emancipated branches of industry. Traditions have survived laws, and the labouring classes continue to live isolated, in a world apart, too often a sealed book to those most interested in being acquainted with it. This characteristic line of demarcation is nowhere more profoundly traced than in England. The English workman is a being apart, having his manners, his habits, his vices, his virtues, his pride, his modes of working, and his amusements peculiar to himself. His mirth and his gloom resemble no other. The miners, the spinners, the weavers, the builders, the stokers, all the workmen engaged in manufacture, have

almost nothing in common with those employed in agriculture. The workmen engaged in manufacture all eventually identify themselves with the regularity of their machines, under the influence, I had almost said the despotism, of the division of labour. They are compelled to go and to come, forward and backward, like the machines *which employ them*: the machine commands and they obey. Their task is regulated with mathematical precision, and their arms make as many movements as the brake-wheels make revolutions. After some time the result is a species of automatic life, a frightful monotony, from which the workman only escapes in his leisure moments by strong and gross excitements, by intemperance, which leads to drunkenness, and this drunkenness itself is of a gloomy and savage nature, like the drinks which have produced it.

The manufacturing system has likewise profoundly modified the character of the English workman. He lives less in the midst of his family, and belongs much more to his fellow-workmen than to his children. His existence has ceased to be domestic. From the commencement he is enrolled in one of the thousands of societies which abound throughout the country, and which, if need be, easily assume the attitude of coalition. The workman's forum is the meeting-place of his trade's union; it is the club of which he forms part, the economic or industrial association to which he is affiliated. These associations are reckoned in England by thousands; they form veritable tribes, which have their regulations, their prejudices, their exigencies—nay, even their superstitions. The spinners and the printers of Manchester, the hosiers of Nottingham, the cutlers of Sheffield, the smiths of Wolverhampton, the potters of Burslem, the colliers of Newcastle, the ribbon weavers of Coventry, the cloth weavers of Leeds, form as many industrial armies, obeying the voice of their chiefs, each ranged under his own banner, and in reality distinguished by a kind of peculiar physiognomy easily recognisable.

The wives and children of these workmen generally follow the vocation of their husbands and fathers. They thus get inured to them at an early age, at least in those branches of industry which admit of the employment of women and children, and they at last acquire faults, and physical and moral qualities, which are really characteristic. Their costume never varies: a spinner, a mender, a collier, a smith, are always dressed nearly in the same manner; and even their hair, particularly amongst the women, is arranged according to their vocation with invariable regularity. Their minds, incessantly bent upon the same object, eventually acquire a gift of second sight, which often, without instruction, leads them to discover improvements of important details. It is seldom, however, that their thoughts travel beyond the regions of the factory and of material enjoyments; and it is a distinctive trait in their character, that none of them dream of making their fortunes as politicians, neither does ambition penetrate their souls. They like labour for its own sake, and it is a great point of self-love with them to devote themselves to it conscientiously and perseveringly. There is a good deal of affinity between them and their machines. They have little initiative, of taste and ideas, and they are infinitely less artistical than ours.

The French workman is nearly in every respect the opposite of the English one. His dependence, proud and haughty, always resembles a concession, and he deems himself attached to a temporary yoke rather than to a permanent workshop. His exactness and stability nowise partake of the English fatality and resignation; he would ever be ready to go, and to give notice rather than receive it. He is more gay, more lively, more talkative, more of a reasoner; and, since the contagion of politics has entered our manufactories, he has become imperious, cavilling, *important*, and rather occupies himself with the government of the state than that of his looms. Among many, business is looked upon as an affair of circumstance and of necessity; they occupy themselves with it because

it is necessary to live, and hitherto politics have not yet discovered the secret of supplying masses of men with a livelihood without labour; but their minds are, in reality, elsewhere, and in quest of perpetual and undefinable ameliorations. The real French workman is the workman of art, and it must be said, whatever may be their faults, such are the Parisian workmen. There are excellent workmen throughout France; there are only perfect ones in Paris. Our weavers of cloth, and our spinners of cotton, resemble, in many respects the English workmen of their categories; but the Lyonnese workman, the designer of Mulhouse, the operative manufacturer of shawls, and he who makes the ribbons of St. Etienne, have always required to receive from Paris *the secret influence*, either by means of the design, or by the idea or the *order explained*, to reach perfection. Paris is like a large school of taste, which gives the tone and the colour. It is there, in fact, that are formed, in innumerable schools of design, mostly gratuitous, these legions of ingrates, who have acquired their talent in establishments maintained by governments which, every ten or fifteen years, they take so much pleasure in upsetting.

If you examine well, you will find, in the provinces, a host of remarkable special manufactures. Doubtless, excellent guns are made at Châtellerault, and at St. Etienne; but it is in Paris alone that beautiful arms are made. Watch-making is carried on very economically and very ingeniously in Franche-Comté, but it is in Paris that the finishing stroke is put to these watches, and it is there only (I am only speaking of France) that they are worthy of their name. Good locks are unquestionably manufactured in Picardy, and which are not dear, but the great lock-makers, the masters of the art, are all in Paris. It is thence that all inspirations emanate. The Chamber of Commerce of that city is now engaged in printing a book, which will be exceedingly curious, and which will clearly explain this economic phenomenon: it is a faithful statement of all the professions exercised in that great city, street by street, and, to some degree, man by man; an analysed register of that

ingenious, intrepid, and capricious ant-hill, called the workpeople of Paris. There will appear, for the first time complete, the nomenclature of these ancient branches of industry whose products, known under the name of Parisian articles, are spread over the entire world, and which know no rivals. Nowhere is such furniture made; nowhere are toys, bronzes, paper-hangings, tapestry, articles of fashion, umbrellas, ornaments, and those thousands of trifles which represent millions in value, produced better than in Paris. This vast industrial encyclopædia comprises entire streets of the capital, the streets Saint Denis and Saint Martin, the street of the Faubourg St. Antoine, the street Grenetat, the street Bourg l'Abbé, the two streets of the Temple, where more than one unknown genius produces masterpieces at wretched prices, and frequently imparts value to nameless materials, to lucifer-matches, for instance, which absorb, it will hardly be believed, whole timber-yards. But the greater part of these branches of industry are entirely domestic; they are carried out, like the work of the milliners and lacemakers, in circumscribed workshops, in which the most skilful mechanical resources frequently secure the independence of the workman, who is paid by the piece, and who manufactures articles for which he has received or furnished the raw material according to the extent of his small capital. It is this mode of labour, common to the Parisian, and the Lyonnese workman, which imparts to both a peculiar physiognomy amongst all the races of French and foreign workmen. London does not produce the immense variety of articles that are made at Paris. Mechanism governs everything, and individual labour does not strive to seize on that part of its domain in which all the marvels of our capital are produced, under the inspiration of the taste which distinguishes its artists. Sèvres, the Gobelins, the Savonnerie, are the types of that brilliant school of decoration whose lustre has shone over the entire of French industry, to the eternal honour of those who have laid or strengthened their foundations.

The more I study the question of workmen employed in manufactures, the more I remain convinced that the true vocation of ours is to excel in those branches of industry which can do without protection, and live an independent life by inspiring themselves with the sacred fire of art. The English so thoroughly understand the French superiority in this respect, that for some time they have made unheard-of efforts to naturalize, amongst the good workmen, the study of drawing and the cultivation of the beautiful, so necessary to the useful. Wanting their own, they borrow our workmen, thus implicitly admitting that neither the progress of machinery, nor the low price of freights, nor the abundance of capital, can compensate for the absence of taste, which is also a creator of value. Open the lists of the jury awards, and you will see how powerfully this peculiar French element of wealth has weighed in the balance, which has only charmed the judges, after having excited the admiration of the entire world. The works of the Lyonnese will probably remain the most brilliant souvenir of this memorable struggle. A third family of workmen has appeared with *éclat* on the great stage of the Universal Exhibition; these are the workmen of the German region, in which are comprised all those of Prussia, of Austria, and those of the other German states. They are less known, and have hitherto made less noise than the French and the English, because they are less agglomerated, less compact. German manufacture, with the exception of that of some towns or valleys renowned for their industrial establishments, is, as it were, lost and drowned in the wave of rural populations, which are the predominating element of that portion of Europe. But the German workmen have just proved of what they are capable, and the world has beheld with admiration a host of products created by them, worthy to compete with those of the most advanced nations. The imperial printing office of Vienna has obtained the council medal, whilst the national printing office of Paris has only obtained the prize one. The Prussian founders have covered themselves

with immortal glory. The valley of Chemnitz, in Saxony, has exhibited a host of articles capable of competing in point of cheapness and good workmanship with France and England themselves. The Austrian cabinet-makers have appeared to me likely to become more redoubtable rivals to those of the Faubourg St. Antoine than those of any other country in the world.

Hitherto, however, these skilful men have only been imitators in everything. The German workman invents little, but he copies marvellously well—not servilely, but by imparting to his works a peculiar stamp of *naïveté*. They are less mechanical than the English, and less artistical than the French; but they rather incline to the French style, wanting, however, their elegance, which they sometimes happily replace by the natural and the simple, when they do not degenerate into mannerism. Their habits are, generally, tolerably temperate. The English eat; the Germans smoke intemperately, by day, by night, I had almost said at meal times, in bed—it is frightful: and if this habit should persist in developing itself, Germany will become uninhabitable. One of my greatest apprehensions is to see this ruinous taste penetrate into our workshops, where it injures and stupifies the children, and causes amongst them more serious ravages than is generally believed. The German workman lives much more in the midst of his family than the other workmen of Europe; and although the absurd spirit of communism is at this moment infecting the German world beyond all conception, the old fundamental qualities which distinguish it will struggle a long time against the tendencies of the evil genius which has been introduced, it must be admitted, into Germany, by the students of the universities. The German workman is patient and thoughtful; he has much more sensibility than the English workman, much less elegance than the French one. He likes to infuse sentiment into his works; and I might mention works in Bohemian glass, toys of Nuremberg, porcelain of Saxony, even printed calicoes, and clocks, which bear strong evi-

dences of this tendency, which might be called pastoral, if it did not frequently degenerate into the trivial and the vulgar.

On the whole, they are a race of men now very much advanced. They have gradually profited by the discoveries and processes of France and England, and after having, for a long time, made common woollen cloths in Silesia, they now manufacture very fine ones at Aix-la-Chapelle. The abolition of barriers between German states, consequent upon the establishment of the Zollverein, has contributed, in no trifling degree, to give to German industry an impulse, which has not ceased to grow under the influence of the habits of order and economy of its manufacturing population, and by the aid of the numerous hydraulic movers, spread over the whole surface of the country. Germany will not arrest its progress in so noble a path, and, notwithstanding the efforts which have been made to allure it to the beaten track of protection, it will complete its interior enfranchisement by the speedy conquest of freedom of commerce.

The Spanish workmen do not deserve the fourth rank in the great working family of Europe; judging only from the actual importance of the products which they have sent to the Exhibition, the Belgian and the Swiss would have the right to take precedence. But Belgium and Switzerland gravitate in the orbits of France and Germany, and their workmen, nearly equally distributed between agriculture and manufactures, are not so original as those of Spain. Spanish workmen are, more than is generally imagined, choice men, remarkable for vigour as well as suppleness, and nearly all of proverbial sobriety. I have been surprised, on going through the manufactories of Catalonia, at the frugality of their habits, their liveliness, and their admirable aptitude for labour. Their intelligence and activity are well calculated to surprise those who judge of Spain from the reputation of indolence and effeminacy enjoyed by its inhabitants. The Galicians, the Basques, and the Asturians, are first-rate workmen;

those of Andalusia not less so, and I have found in the province of Valencia, unjustly renowned for its idleness, workmen endowed with as great an energy and ingenuity as those engaged in our silk manufactures of Lyons and Avignon. The contagion of socialism has not yet penetrated amongst these vigorous and poetic populations. They are, doubtless, much behind-hand as regards education, and do not possess all the resources of machinery of the English workmen; neither are they endowed with the indefatigable and serious perseverance which characterises them, but they are eminently fitted for industrial pursuits, and the sacred light of ancient art which has shone in Spain is on the point of being rekindled amongst them. The two last expositions of Madrid, although very incomplete, have raised the most legitimate hopes in this respect. The Spanish workman is in the path of progress, since the fall of the régime which favoured idleness and recklessness in his country; as soon as the greater portion of the convents were transformed into factories, other manners began to prevail, and I am acquainted with robust monks who have become excellent spinners.

Spanish industry cannot fail to revive in conditions compatible with the country, thanks to the peculiar facilities which the workman is assured of finding in the mildness of the climate, the abundance of raw materials, and, above all, the richness of its mineral products. It will be long before Spain will have to dread the invasion of the doctrines which have perverted the moral sense of the other working populations of Europe. "The workman of that country," according to the expression of M. Ramond de la Sagra, "knows not yet to curse the hand that pays him; he accepts labour as a duty, never as a yoke; he obeys from conviction and from habit, and he preserves his pride and his integrity in the humblest station." Would I could say the same of the Italians; but there is no longer an Italy. Italy no longer belongs to herself, and does not know herself; and but for the vigour of Piedmont, which her recent misfortunes have

not been able to cast down, and which carries in her bosom the destinies of the Peninsula, we should have to look to the past rather than glimpse at the future, for the glory and prosperity of the Italian workman. Who will some day reveal to us the mysteries of the Indian working world!—who will cause the light to penetrate into those workshops of the East, where the hand of man is incessantly occupied for a pitiful and precarious remuneration, inferior to the wages, already so wretchedly low, of our manufacturing operative? Thus, at both extremities of the scale, the spindle and the weaving loom produce the same economical results for the lot of the labourer. In France and in England, in Germany and in Spain, in Switzerland and in Belgium, there are entire generations who scarcely earn sufficient to live under the rule which protects them. Is not this protection an illusion? Is it not the workman who suffers from the ulterior competition, and the master who profits by the external restriction? The same cause which exhausts the one does it not enrich the other? and might it not be asked—Which is the dupe? Reply—Every body is duped: how long will it last?

As a contrast, in every respect, to the energetic and laborious habits of the European workman, we shall conclude our chapter with the subjoined account of

INDIAN HANDICRAFTS.

An English engineer in India describes his experiences amongst the native workmen in an amusing article in *Chambers' Journal*, from which the following is condensed.

I had the anvils raised upon wooden blocks, so as to necessitate an erect posture while at work. The poor fellows submitted with the best grace they could, but seemed greatly embarrassed. The queer shaky way in which they stood, and the undecided flexure of the knee and hip-joints, were so indicative of a tendency to flap down on the slightest possible pretence, that it was really impossible to look at them without laughing. The work went on

very slowly; but I hoped that all would soon go well: alas! I had under-estimated the tenacity of a race-established precedent; and, so, one afternoon, I found my blacksmiths perched on blocks of wood of the same height as their anvils, and hammering away with all the vigour which the stability of their tottering pedestals admitted of! It was hopeless contending with such a demonstration as this; so, to the great joy of the *lohairs* (blacksmiths), I allowed the anvils to be placed once more on terra firma. Time, which the Englishman values as money, has a very secondary place in the estimation of the Oriental. The *radj*, or bricklayer, is, I think, about the best illustration of this. He works with a trowel about the size of an ordinary tablespoon, and a small hammer weighing about six ounces. Armed with these, and squatting before his work, he, in a loud voice, summons his *rundees* (women, two of whom always wait upon each *radj*), and orders them to bring *eentee* and *massala* (bricks and mortar). The *rundees* in due season make their appearance—one with a brick in each hand, and the other with a small wooden trencher, about the size of a bread basket, filled with the *massala*. I am much within the mark when I say, that a single English bricklayer and hodman could in one day do the work of a dozen *radjs*, *rundees*, and all; and do it much better too. One would imagine from this that building was a very expensive process in India; but the contrary is the case. An English bricklayer and hodman will cost from eight to ten-shillings a day, while the Indian *radj* and his two attendant *rundees* will not cost more than from threepence to fourpence per day.

The writer next attempts to introduce the barrow for earthwork in place of the little cowrie baskets, holding about a spadeful each. After a great deal of see-sawing, one poor fellow managed to deliver his freight. Thinking that a little practice, unembarrassed by my presence, would familiarise them with the barrow, I left them for a time, and on return I beheld the wheel-barrow borne along by four men, very much in the style in which dead men are

carried off the stage—that is, two at the head and two at the feet—palanquin style, in short. A set of lighter ones, little larger than those with which boys are accustomed to amuse themselves in England, was made, and success for a time was complete; but one day, happening to come upon them unexpectedly, there were half-a-dozen of the men walking along with the greatest possible gravity, each carrying his wheelbarrow on his head—legs in front, and wheels behind! Even after I had threatened to dismiss the first man I found carrying his wheelbarrow on his head, I met a serious-looking old man tottering along with his barrow laid across his arms like a baby in long clothes!

The first snort of the iron horse seems to have produced a complete panic, and the movement of a steam-engine was hailed like a new Avatur. I was at much pains, he says, in endeavouring to explain the principles of its action to the most intelligent of the workmen; but I found they had long ago provided themselves with what, to their thinking, was a complete theory of the whole matter. The doctrine was, that the boiler contained an English *bhoot* (spirit); that we made a fire beneath the boiler, and roasted the said *bhoot* until he called out *duhagei* (mercy) through the safety-valve; and then only, and not before, would he go to work: the water was merely given to quench his thirst!

The time is not far distant when the rich produce of Central India will be poured into Europe with a profusion and regularity never yet dreamed of. The steam-engine is destined to do more for India than all her other teachers have yet effected. This iron apostle of civilization does not declaim; it does not dispute nor vituperate; but it works, and always succeeds.

CHAPTER III.

MANUFACTURES FROM CAOUTCHOUC.

(From the Jury Reports.)

ACCOUNT OF PRODUCTION OF CAOUTCHOUC—HOW PREPARED AND PURIFIED—FIRM OF MACKINTOSH AND CO.—MR. GOOD-YEAR—VULCANIZATION OF INDIA RUBBER—ITS CONTINUALLY INCREASING USEFULNESS — MANUFACTURES FROM GUTTA PERCHA—MODE OF OBTAINING GUTTA PERCHA—REMARKS ON ITS VARIOUS USES.

THE existence of a milky juice in many plants, which flows from them when their tissues are wounded, is a fact that has been familiarly known from time immemorial. It is, however, only a matter of recent discovery that this milky juice characterises several families of plants. Although the great majority of plants which yield this juice in abundance are tropical, yet they are not without their European representatives. The spurges, dandelion, and celandine of our road-sides, are instances. The families of plants which furnish this milky juice in the greatest abundance are Moraceæ, Euphorbiaceæ, Artocarpeæ, Apocynaceæ, Cichoraceæ, Papaveraceæ, Campanulaceæ, and Lobeliaceæ. This juice, which is called by botanists "the milky juice," because it has an appearance similar to milk, has also the physical constitution of that fluid. It is an aqueous liquid, charged with soluble matter, in which float globules of a substance insoluble in water, and which are by their tenuity held in suspension in the liquid, but for which they have no affinity, in the same manner as butter is held in suspension by milk. From the difference of the refractive powers of these two substances, each of which, taken separately, would be colourless or transparent, arise the opacity and white colour of the two; hence the compound is properly called a "milky juice."

The analogies which this juice exhibits with the milk of animals and vegetable emulsions are seen in the manner

in which it acts when left to itself. Run out into the air, received and preserved in close vessels, it separates itself into two layers, as milk itself would do. The watery part very soon has an insoluble part floating upon it, which collects together, and swims at the top as cream swims upon milk, and which forms nearly half of the entire mass. But with these physical resemblances the analogies cease. That which in milk and in emulsions produced from seeds collects on the surface of the aqueous liquor, is, properly speaking, a fatty body containing oxygen in its composition, as they all do; while the kind of cream which swims upon the milky juice of the plants when left to itself, is one of the compounds of carbon and hydrogen which are found so frequently in organic bodies. The latter, when obtained for commercial purposes, bears the Indian name of *caoutchouc*.

This substance has long been known to the natives of both the Old and New World, in Hindostan and South America. It was not, however, till the expedition of the French Academicians to South America in 1735, that its properties and nature were made known in Europe by a memoir upon it by M. de la Condamine. This notice excited little attention; and subsequently notices of this substance were sent to the French Academy, in 1751, by M. Fresnau, and in 1768 by M. Macquer. At the latter end of the last century and the beginning of the present it was brought into this country in small quantities, where, on account of its being used for rubbing out black-lead pencil marks, it acquired the name of India-rubber. Although, after its application to the waterproofing of garments, its consumption gradually increased, the importation into the United Kingdom in 1830 appears not to have been more than 50,000 pounds. In 1842, the import of this article had increased to between 700,000 and 800,000 pounds. Up to the present time the consumption of India-rubber has prodigiously increased; and one part alone in South America is said now to send to Great Britain nearly 4,000 cwts. annually. To the large consumption in the United

Kingdom we must add that of America, where the application of caoutchouc has been much more general and successful than even in our own country.

The particular species of plants which are employed for procuring India-rubber are very numerous, and it is probable that many yield it which are not yet known to botanists. The tree which supplies most in continental India is the *Ficus elastica*, a tree belonging to the order Moraceæ; it is exceedingly abundant in Assam. All the species of ficus yield caoutchouc to a greater or less extent in their juices, and even the common fig (*Ficus carica*) of Europe contains it. Species of ficus produce the caoutchouc brought from Java, and *F. radula*, *F. elliptica*, and *F. prinoïdes* are amongst those mentioned as affording a portion of that brought from America. Next to the Moraceæ the order Euphorbiaceæ yields the largest quantity of caoutchouc. The *Siphonia elastica*, a plant found in Guiana, Brazil, and extending over a large district of Central America, yields the best kinds of India-rubber that are brought into the markets of Europe and America. To another order, Apocynaceæ, we are indebted for the caoutchouc which is brought from the islands of the Indian Archipelago. The plant which is the source of this substance in those districts is the *Urceola elastica*, a climbing plant of very rapid growth and gigantic dimensions. A single tree is said to yield, by tapping, from fifty to sixty pounds annually. Many other plants of this order yield caoutchouc, and of those given on good authority we may mention *Collophora utilis* and *Cameraria latifolia*, plants of South America; *Vahea gummifera*, in Madagascar; and *Willughbeia edulis* in the East Indies. To this order belongs the cow tree, or Hya hya (*Tabernæmonta utilis*), of tropical America, which yields a milky juice that is drunk by the natives of the district in which it grows. The caoutchouc, whilst it is in the tissues of the plant, is evidently in a fluid condition, but after its separation from the other fluid parts, its consistence becomes changed, and it forms a solid mass similar, in its external characters, to

vegetable albumen. In this state it is dense and hard, but may be separated and rolled out so as to form a sheet resembling leather. It has many interesting and peculiar properties. Insoluble in water and in alcohol, it dissolves in ether, in the sulphuret of carbon, the fat oils, and the liquid carburets of hydrogen. It is soft and elastic at the ordinary temperature, but at the temperature of two degrees above the freezing point, it acquires the hardness of wood. A temperature of 100 degrees softens it without altering its form. It then unites with itself with the greatest facility, and two pieces recently cut apart reunite so as to render it impossible to discover where the junction has taken place. But a higher temperature, approaching 150 degrees, changes it into an adhesive substance, which, on cooling, does not recover the primitive properties of caoutchouc. In this state of recent coagulation, and while still in a pulpy condition, caoutchouc possesses a degree of plasticity which admits of its receiving, by means of moulds, the most varied forms.

The greater part of the caoutchouc of commerce is obtained by the natives of the countries in which it is produced, in the form of shapeless masses, collected at the foot of the tree which has been incised or cut, for the purpose of extracting the juice from it, or solidified in a trench made in the earth, and coagulated in this rude mould in voluminous masses, which often resemble the trunk of a large tree. A part of it, however, possesses other forms, which the rude art of the natives attempts to communicate to it. They model, with plastic clay, figures of animals, imitations of the human foot, and pear-shaped bodies, and then dipping these moulds in the thickened caoutchouc, and renewing the connexion when the first coat is solidified by exposure to the air, they obtain, by breaking the mould and getting it out in fragments through an opening properly arranged, hollow flasks, figures of animals, rough slippers, &c. They thus make caoutchouc serve for the manufacture of objects for which we ourselves employ animal membranes and leather. Caoutchouc is

obtained from both the Old and New World. The East Indies furnish caoutchouc, of which numerous specimens have been exhibited in the Crystal Palace by the East India Company. This caoutchouc, which comes principally from Java, is often glutinous, and is less esteemed in commerce than that furnished by the equatorial regions of America. Great quantities of caoutchouc are imported into Europe from Mexico, from South America, and especially from the province of Para, in Brazil. That which comes in the shape of bottles is generally preferred, and when it is pure, and the different coats which comprise it are well united, it may be employed immediately for many purposes. But it often happens that the coats which form the pear-shaped masses are badly united. It then becomes necessary, in order to make use of them, to work it up by a process of kneading, so as to obtain it in a coherent or homogeneous mass. This operation becomes especially indispensable when, as most commonly happens, the caoutchouc is in large impure masses, and mixed with sand and the debris of vegetable matter. These impurities do not entirely proceed from the moulds made in the earth, into which the juice has been allowed to exude, and in which it has been left to thicken and solidify, for their quantity and their presence between the coats of the pyriform masses show that the impurity is mainly to be attributed to fraud. The caoutchouc thus obtained is not applicable to any use until it has undergone a previous purification. The purification of the caoutchouc is accomplished by submitting the impure caoutchouc to the action of cylinders furnished with teeth turning in opposite directions and with unequal velocities, which cause it to undergo a kind of mastication. If the matter which renders the caoutchouc impure adheres very closely when dry, this property is lost when it is moistened. From this it happens that, by causing a small jet of water to flow into the apparatus, these foreign matters, crushed by the mill, are carried off by degrees, and the purified portions of caoutchouc unite the one with the other. By the subsequent

exposure of these masses of purified caoutchouc to a second mastication, but performed dry, they are softened by the heat evolved during the forcible compression to which they are then submitted. In this treatment the caoutchouc becomes softened without being liquefied, and a homogeneous mass is formed which is cut in the form of rectangular blocks. These are again placed in casting moulds, in which they are powerfully compressed, until they are completely cooled, when it is found that the pressure has freed them from cavities, air-bubbles, &c. By submitting them to the action of knives moved very rapidly by a mechanical action, and the edges of which are constantly kept wet by a thin jet of water, the caoutchouc is cut into sheets of various thicknesses, which, subdivided in their turn, constitute those small parallelopipedons used by draughtsmen to rub out the marks of black-lead pencils.

This use of caoutchouc was, in England, for a long time the only one to which it was applied; but this limited use was far from indicating the extent to which caoutchouc has been employed in the last thirty years, or the multiplicity of services it has been called upon to perform for sanitary and industrial purposes. To rub out pencil marks, to form the rude slippers which seemed well adapted to the Indian toilet, but to which a form acceptable in Europe had not been imparted, were, in fact, the only uses to which caoutchouc was applied up to 1820. In England was discovered the art of stretching it into thin sheets, and thus making it available for the production of waterproof fabrics. In France was discovered the art of drawing it out into delicate threads for the manufacture of elastic tissues. We are indebted to Messrs. Mackintosh and Hancock for the application of caoutchouc to the rendering tissues waterproof, and for the manufacture of those garments which throughout the world have rendered unquestioned service to the cause of health, and made the name of one of their inventors so justly popular. The garments called Mackintoshes are well known. They are formed of fabrics covered on one side with caoutchouc, or two fabrics

are united by the caoutchouc between. They are thus rendered impermeable to water, but at the same time they possess a flexibility such as it had never been possible to obtain by the employment of other varnishes. For the purpose of obtaining the sheet of caoutchouc sufficiently thin for this purpose, it is dissolved. The solid carburets of hydrogen are soluble in the liquid carburets, and for this purpose spirits of turpentine and the volatile products of coal tar were first employed. But after having obtained this solution, it was necessary to evaporate a great quantity of it for the purpose of obtaining a coating of caoutchouc, which at first occupying a great space, should be reduced to a small one when the drying was complete. For the purpose, however, of economising the solvent, a method is employed of kneading the caoutchouc, by means of powerful machines, with the spirit of turpentine or naphtha, and impregnating it with the menstrua without dissolving it, and softening it without making it a liquid; the caoutchouc rendered pulpy, is then spread upon the cloths by means of a flattening mill, and the process of evaporation is thus dispensed with. Waterproof garments were thus rendered cheap and available for the use of every class. This description of garment, nevertheless, presented a notable fault which was not avoided until a later period, and which arose out of the properties inherent in the caoutchouc itself. This substance, which in ordinary circumstances, possesses very great elasticity, such as to justify the name by which it is designated in France, *gomme élastique* (elastic gum), loses this elasticity when exposed to a temperature near the freezing point of water, and this suppleness, which might almost cause a sheet of caoutchouc to be mistaken for an animal membrane, gives place all at once to the rigidity exhibited by the same membrane when dried. This property, which in cold weather was a real defect, when applied to fabrics rendered waterproof by caoutchouc, has been found very useful in the making of garters, braces, and other articles in which the elasticity of the caoutchouc has been brought to supersede that

which had, until then, been obtained by the employment of spiral metallic springs. In order to obtain the threads which are used for the manufacture of elastic tissues, either the flasks of caoutchouc in its natural state, cut in half and flattened by pressure, or else those masses of purified caoutchouc which are sold in continuous sheets, cut by knives, wetted by small jets of water, are employed. These sheets are divided into thongs; the latter are afterwards subdivided into very narrow bands, which serve in their turn to produce the threads employed for the manufacture of the tissues. If by a slight elevation of temperature the natural elasticity of the caoutchouc is increased, these narrow bands can then be stretched into threads of great length by drawing them out and rolling them upon bobbins. But it may be well conceived that the management and weaving of the threads would be very difficult if they retained their elasticity. Fortunately the particles of the caoutchouc eventually accommodate themselves to the forced position which they have been made to assume, and the exposure to a low temperature materially hastens this result. The threads having thus lost their elasticity can then be introduced like common threads into the fabrication of stuffs; they can be covered with a different thread, by winding spirally round them cotton, silk, &c., and this compound thread may be in its turn introduced into the composition of new tissues. In all these operations the caoutchouc has retained all its rigidity, but that elasticity of which it has been deprived by a long distension and a low temperature, can be restored to it by means of a proper degree of heat. The stuff thus woven is exposed to a temperature of from 140 degrees to 160 degrees Fahrenheit, by the passage of a hot iron, when each thread resumes with its primitive length the diameter which it first possessed. The fabric diminishes in length without increasing in width. The tissue is thus compressed, and the caoutchouc, which has regained its elasticity, communicates it in a permanent manner to these tissues. The manufacture of these threads of caoutchouc constitutes at present

a distinct branch of industry from that which, making use of them either in an uncovered state, or covered with silk and cotton, combines them with ordinary threads in the way of weaving; and, like the manufacturers of linen or cotton fabrics, the makers of the elastic tissues buy the threads of caoutchouc in bobbins of different numbers. When the limited lengths of the narrow bands from which these threads are manufactured is borne in mind, the necessity is foreseen of being able to unite them end to end for the purpose of making continuous threads. A remarkable property of caoutchouc renders this easy. It unites with itself with the greatest readiness if it be the least warm; and two surfaces recently cut with a very sharp instrument, may be made to adhere together by means of pressure, with a cohesion equal to that which unites the other parts of the same thread. But although in this case this property is made useful, in other instances the limited elasticity, and the rigidity communicated to it by a low temperature, are great drawbacks. However, all these properties inimical to its use disappear in that combination of sulphur with caoutchouc called vulcanized India-rubber, which exhibits such special properties as to form in some degree a new substance. This transformation of caoutchouc was first applied to practical purposes in America.

While in England the employment of caoutchouc was being developed principally in regard to the rendering of cloths waterproof, and in France its elasticity was being made available for the manufacture of certain tissues, it was turned to account in America for waterproof shoes, by making use of the processes discovered by Mr. Charles Goodyear, who, since 1836, had been engaged in the discovery of means for making use of caoutchouc, with a skill and perseverance which have borne the most happy fruits. It is not that attempts at fashioning according to the European taste, and thus rendering useful the Indian shoe made of caoutchouc, had not been frequently made in Europe, but these attempts had hardly been successful in

giving them acceptable forms, and the stiffening by cold rendered them very inconvenient. However, Mr. Goodyear at last succeeded in making shoes of raw India-rubber purified, and perfectly free from objection, thus completing by the manufacture of waterproof shoes the service which Mackintosh had begun by the invention of the garments which bear his name. Since 1842, Mr. Goodyear has imported into Europe shoes which possess an unlimited and permanent elasticity, and which resist cold; two of their surfaces may be pressed against each other without the least adhesion taking place. These are precisely the remarkable qualities which characterize that caoutchouc which is called in the present day vulcanised India-rubber. Impressed, perhaps, with the idea, too often moreover a just one, that the specification of a patent is sometimes nothing more than the occasion of attracting the attention of imitators, Mr. Goodyear took no patent for this article, but he endeavoured in Europe to take advantage of his discovery, by communicating it as a process of which he alone possessed the secret, which might be lost to mankind, and disappear with its sole possessor, when Mr. Thomas Hancock, of Stoke Newington, who had been engaged in Europe in the working of caoutchouc with no less perseverance and success than Mr. Goodyear in America, discovered anew the process of the vulcanisation of India-rubber, and secured it by a patent, which Mr. Goodyear afterwards demanded for the same subject. Mr. Thomas Hancock discovered that a band of caoutchouc dipped into melted sulphur, and impregnated with this substance, without losing any of its properties, only required to be afterwards exposed to a temperature of about 300 degrees Fahrenheit, to acquire properties entirely novel, which were precisely those possessed by the material employed by Mr. Goodyear for the waterproof shoes.

This was, as may be seen, a new discovery of a fact already known—a novel solution of a problem which was known to be soluble, since it had been already solved. This discovery must, however, have presented its difficul-

ties, and required also the fortuitous co-operation of favourable circumstances. For though analysis might have pointed out to Mr. Hancock the existence of sulphur in the productions of Mr. Goodyear, and have also disclosed the presence of the salts of lead which the latter had deemed indispensable, it could not in any manner give him a clue to the discovery of the essential condition of this transformation, that is to say, the employment of a given temperature, which alone was able to impart to the mixture of caoutchouc and sulphur the new properties which appeared to make of it an entirely new body. Whatever may be the share of merit assigned to Mr. Goodyear and to Mr. Hancock in this important invention, the latter has not the less exclusive merit of having discovered that sulphur was the sole cause of the vulcanization of India-rubber. On seeing Mr. Charles Goodyear introducing the different salts of lead into the specification of the patent which he subsequently took out, it is felt that he regarded their intervention as indispensable, while it is now demonstrated that sulphur alone is sufficient; if other substances are employed in certain cases, it is not so much to aid in the vulcanization of the caoutchouc as to add to its weight and solidity.

The vulcanization of India-rubber is an easy process. The India-rubber, softened by the heat evolved when it is being kneaded by strong machines, is mixed with the sulphur in the masticating apparatus already alluded to. This mixture retains all the solubility of the caoutchouc in the different menstrua—the property of becoming hard at a low temperature as well as that of uniting with itself; but as soon as it is exposed to a temperature of 300 degrees Fahrenheit—a temperature which would have sufficed to change the pure caoutchouc—the matter acquires new properties. It is no longer soluble in the menstrua which dissolve caoutchouc, but is impregnated with them by contact, and swells out like an animal membrane that is moistened with water; resuming its primitive properties on being dried. It no longer becomes rigid when exposed

to cold, nor does it unite with itself, and it resists without any alteration a temperature which would have sufficed to transform the ordinary caoutchouc into a sticky matter; it is, in short, vulcanized India-rubber. This absence of the tendency to adhesion is so decided, that in actual manufacture no use whatever can be made of the shavings of the caoutchouc thus modified, and the means of separating the sulphur and reproducing the pure caoutchouc presents at the present day an important problem to solve. If this action of heat which modifies the caoutchouc is exercised upon a mixture enclosed and compressed in a mould, the material then acquires a form which the indefinite and permanent elasticity of the vulcanized India-rubber causes it to retain. This sulphurization of the India-rubber, instead of being produced with free sulphur, may be obtained with sulphur in a state of combination, as with the chloride of sulphur. If articles of common caoutchouc are immersed for one or two minutes in chloride of sulphur, diluted in fifty or sixty times its weight of sulphuret of carbon, they acquire by exposure to a proper temperature all the properties of vulcanized India-rubber. In commerce this caoutchouc is designated by the name of converted caoutchouc. From the moment in which the vulcanization of India-rubber was known, all the inconveniences which ordinary caoutchouc presented having disappeared, its employment received an extension which is continually increasing, and each year sees new applications of this product spring into use. The enumeration of the objects exhibited by the two manufacturers to whom this branch of manufacture is the most indebted, Mr. Goodyear, in America, and the firm of Mackintosh, in Europe, will tend to show how widely spread, and how varied the use of this material has already become.

MANUFACTURE FROM GUTTA PERCHA.

The substance designated by the name of gutta percha, is, like caoutchouc, a carburet of hydrogen, and isomeric with that substance, and possesses a great number of the

properties which characterize India-rubber, but exhibits certain special properties which admit of its being applied to particular uses to which caoutchouc is not adapted. Gutta percha possesses as great an indestructibility by means of chemical agents as caoutchouc. It has an intermediate consistence between that of leather and wood; it is capable of being softened by heat, and of regaining its primitive consistence on cooling. It is, therefore, at the same time, capable of taking, and of retaining the most delicate impressions. The important uses to which it has been latterly applied, are only the forerunners of those to which it will be adapted hereafter, provided the lack of this precious material (which unfortunately is produced in much less quantities than India-rubber, and in localities much more circumscribed) does not present an obstacle to it.

Whilst the plants which furnish caoutchouc abound in the whole of the territorial zone which extends between the tropics, the *Isonandra gutta*, belonging to the natural order Sapotacea, is the only tree which yields gutta percha. It grows scarcely anywhere, except in certain parts of the Malayan Archipelago, and up to the present time has been almost exclusively obtained from Singapore. It was brought for the first time into England in the days of Tradescant, as a curious product, under the name of *Mazer-wood*, and subsequently it was frequently brought from China and other parts of the East, under the name of India-rubber, in the form of elastic whips, sticks, &c. In 1843, Doctors D'Almeida and W. Montgomery drew particular attention to it, together with its various singular properties, its easy manipulation, and the uses for which the Malays employed it. The most common employment of it was for whips; and it was by the introduction of a horse-whip made of this substance, that its existence was for the first time known in Europe. The exhibition of the products of the East Indies, shown by the Honourable East India Company, proves that the natives of the country in which the *Isonandra gutta* grows,

knew also how to appropriate it to the manufacture of different kinds of vases, and that European industry has little more to do than to imitate their process.

The importation of gutta percha into England, where the employment of this substance first drew attention, was in 1845 only 20,600 lbs.; but in 1848 it had increased to above 3,000,000 lbs.; and during the last three years, the importation has amounted to a much larger quantity, and one which begins to cause some apprehension as to the possibility of the supply sufficing for the requirements of the novel uses in store for it in the future. It is true, that during its use, gutta percha is but little consumed, and the waste from the articles in this material, submitted to a proper softening, can be made to serve new uses; nevertheless, its constantly increasing consumption, added to the barbarous manner in which the product has hitherto been extracted, may justify some apprehension.

During the first few years of the employment of gutta percha, it was the custom to cut down the tree for the purpose of obtaining the juice, which, left to itself, very soon allowed the gutta percha to separate and coagulate of its own accord. There is reason to hope that European industry will soon be embarked in the cultivation of this product, and that the *Niato* (which is the name that the Malays give to the tree which produces gutta percha), multiplied by means of a regular culture, naturalized in other countries than those to which it is indigenous, and worked by regular incisions, which will only take from the tree a portion of its juice without hindering its development, will be the means of furnishing, at a low price, a substance which is destined to render notable services to industrial and domestic economy.

The gutta percha, which arrives in Europe in the form of lumps of some pounds weight, is far from being pure. The natives of the Malayan Archipelago make no scruple of introducing into it stones, earth, &c.; the presence of which in the interior of these blocks renders a purification indispensable, which purification, however, is capable of

being attained without much manipulation. Ever since its first introduction into Europe, gutta percha has, in fact, found everything provided for the purpose of cleansing it, and has been found capable of being worked by the processes and instruments which are employed in the purification of India-rubber. At the present day the block of gutta percha, cut into slices by a strong machine, is softened by means of hot water, divided and torn into shreds by the same machine that is used for India-rubber, which serves to knead the gutta percha in such a manner, that the crushed stones and earth may be separated from it on being diluted in the water; it is then dried, and submitted, by means of a powerful machine, to a mastication similar to that which India-rubber is made to undergo; and when, after some hours of kneading, the mass has become homogeneous and sufficiently softened, it is drawn by the drawing-mill into cylindrical cords, into tubes of various diameters, or it is spread out by means of the flattening machine (as is done with lead) into sheets of various thicknesses, which are finally divided into bands, from which are cut out, with a ripping tool, the pieces which are required to be employed in different uses.

Whatever difficulty manufacturers may have had in procuring gutta percha fit to be made use of, they have at least been able to concentrate their efforts upon the discovery of uses to which it is adapted; and in the space of a few years have discovered numerous and important ones, as may be witnessed in the beautiful exhibition made by the Gutta Percha Company. One of the first and principal uses of gutta percha was to supersede the leather bands employed in machinery for the transmission of movements. This is very nearly the only use to which it has hitherto been employed in France. It seems, moreover, that latterly in England some inconveniences have been found to result from this employment of gutta percha; but should its use for that purpose diminish, every day others are found for it. Indestructible by water, and at the same time a bad conductor of electricity, gutta percha has been

found available for enclosing the metallic wires employed in the electric telegraph; and the use of this substance may certainly claim its share in the success of the submarine telegraph, which has just brought London and Paris within a few minutes of each other. It may be conceived to what a variety of forms a substance can be turned, which becoming soft without adhering at the temperature of boiling water, regains at the ordinary temperature the slight elasticity and the consistence of leather. Thus agriculturists and manufacturers have turned it to account for the fabrication of buckets of all kinds, light, indestructible, and capable of being mended by a slight degree of heat and pressure when they are worn out. It is especially in the manufacture of articles for maritime use that gutta percha, resisting as it does the action of water, and especially of salt water, appears to be the best adapted. Buoys of every description for anchors, nets, &c., have been made of it; sailors' hats, speaking trumpets, &c. There is no doubt that it will be brought to perform a useful part in waterproof garments, as well as in the construction of life-boat apparatus. If India-rubber has been advantageously combined with leather, it may be conceived that the combination of gutta percha with wood, of which Mr. Foster has shewn a specimen at the Exhibition, may in certain cases offer peculiar advantages.

The decorative art has also taken advantage of the plastic properties of gutta percha. All those different articles of furniture, the prices of which are so much enhanced by carving, are capable of being reproduced by means of pressure, and thus multiplied at a low price. Writing-tables, work-baskets, &c., can be produced in gutta percha, and thus be made to combine the threefold advantage of lowness of price, elegance of form, and absence of fragility. In the large manufactory which is more especially devoted to the employment of gutta percha, are made every day a great quantity of mouldings, friezes, panels, leaves, &c., and of articles of every description. These, combined by the decorator, covered with gilding

(which gutta percha takes in perfection), are, in the manufacture of picture frames, and in the decoration of furniture, capable of superseding the carving upon wood, which is so costly, or papier-maché, and carton-pierre, which presents the defect of great fragility. On going through the exhibition of Messrs. Thom & Co., as well as that of the Gutta Percha Company, we may judge of the extent which the employment of this substance promises to the decorative art by the imitation of carving upon oak, rosewood, &c. Bronze articles have also been reproduced in a felicitous manner; and the clearness of the edges and the purity of the forms make it easy to understand how gutta percha has been found capable of being used for making galvano-plastic moulds, and how some experiments have begun to be tried for the purpose of substituting this material in the process of stereotyping, for the metal with which at the present day the pages of our illustrated books are multiplied. This employment of gutta percha for the reproduction, by pressure, of objects for interior decoration cannot but be widely extended, enabling the many to enjoy those graceful and elegant forms which, as long as they could not be reproduced in a material indestructible by water and free from fragility, could only be brought within the reach of the few.

Quite recently, by the exertions of Mr. Truman, a lump of coloured gutta percha, moulded into the form of a jaw-bone, has been found capable of holding together artificial teeth, and thus advantageously superseding those settings in gold, which were so costly, and the absolute rigidity of which, moreover, presented much inconvenience. The slight but sensible elasticity possessed by gutta percha renders it, on the contrary, very well adapted to this use. There is another use to which the exertions of H. Mapple have rendered gutta percha applicable. Soles of this substance, glued on to the upper leathers by means of gutta percha dissolved in gas-tar, constitute shoes which are not affected by water, which last a long time, are very simple and economical in their make, the soles of which are easily

mended, and easily put on again when they come off, and can be made to serve anew by means of a fresh kneading up when they have become unfit for use; thus constituting a description of shoes, the use of which cannot fail to become extended in such a general manner as to render notable service to health. Gutta percha soles have also been found capable of being affixed with much advantage upon leather soles. This solution of gutta percha in the oil of tar, like that of caoutchouc, which, by its evaporation, leaves the caoutchouc uninjured, can be made use of to obtain sheets of gutta percha of extreme thinness, which have already been begun to be used in surgery, as well as in the preparation of waterproof papers and cloths. It is more especially to the manufacture of chemical utensils for the preservation and conveyance of acids, that gutta percha seems destined to render the greatest services. Latterly pumps for hydrochloric acid have been made of it, pipes for conveying this acid, bottles in which to send it away; large wooden vessels have been lined with gutta percha, in which to preserve the acid; gasometers are being constructed, which will be capable of collecting the sulphuric acid disengaged in certain chemical actions, and which would have corroded metallic vessels.

A council medal was awarded to the GUTTA PERCHA COMPANY for their various novel applications of this substance, and for the extensive specimens they exhibited. A prize medal was also awarded to the WEST HAM GUTTA PERCHA COMPANY, for the rich variety of objects they exhibited, amongst which one of the most conspicuous was a group representing a boar hunt, covered with a metallic coating in imitation of bronze, which displayed the success with which gutta percha may be employed in the decorative and even fine arts. The exhibitor succeeded in combining gutta percha with sulphur and the metallic sulphurets, to which the name "metallo-thianised" gutta percha has been applied. The gutta percha thus treated is as hard as ebony, and can be used for most purposes to which wood and ivory are generally applied.

CHAPTER IV.

SUBSTANCES USED AS FOOD.

AMERICA, ITS RAW PRODUCE—SCOTLAND, MESSRS. LAWSON AND SON—AGRICULTURAL SEEDS, GIBBS AND CO.—MALT AND HOPS—BEER—CHAMPAGNE—TOBACCO—ASSAM TEA—COFFEE—CHICORY—COCOA—PARAGUAY TEA—PRESERVED MEATS—PRESERVED VEGETABLES—CANADIAN PRODUCTS—NEW BRUNSWICK—NOVA SCOTIA—AUSTRALIA—NEW ZEALAND—CAPE—FRENCH PRESERVED MEATS—AUSTRIAN CONTRIBUTIONS—SPAIN—SWITZERLAND—UNITED STATES—MEAT BISCUIT—OSMANZONE—PRESERVED MILKS—CAVIARE, ZUPANG, ETC.—BIRD'S NESTS—PREPARATIONS OF BLOOD—HONEY—ISINGLASS.

IN inviting the attention of our readers to the consideration of Food, we confess we are no disciples of

“——— Those budge doctors of the Stoic fur,
Who fetch their precepts from the Cynic tub,
Praising the lean and shallow abstinence.”

We urge that moderation in the use of the good things of this life is a far superior virtue than that of total abstinence; and we hold to the sentiment expressed by Milton, which we take to be his own, albeit he has put it into the lips of Comus—rather a questionable authority, our adversaries may suggest. Let us see, however, what the jolly reveller advances, for truth is valuable from whatever source it may proceed—

“——— If all the world
Should in a pet of temperance feed on pulse,
Drink the clear stream, and nothing wear but frieze,
Th' All-giver would be unthanked, would be unpraised,
And we should serve him as a grudging master,
As a penurious niggard of his wealth,
And live like nature's bastards, not her sons.”—*Comus*.

Let us, then, now open our eyes and admire the vast fertility of nature, and contemplate with thankfulness the

various means of food and subsistence that the bounteous hand of Providence has provided for the benefit of mankind. An American gentleman, walking through the Exhibition, was somewhat cheered, when looking round on the empty spaces and half-filled cases devoted to the United States, by the remark of an Englishman, that at any rate America had the advantage in her specimens of corn and maize and salt meat, which might be said to be the raw material of the whole Exhibition. This is a true statement of the fact, and it indicates the most important relation of America to Europe. The inhabitants of the Old World do not seek the shores of the New to indulge their taste in the fine arts, or provide themselves with luxuries to deck their tables and adorn their palaces. It is the demand for food—lying at the root of all more transcendental tastes—which drives the European to America. How fitly, then, were the United States represented by ploughs, harrows, drills, waggons, sacks of corn, ears of maize, and barrels of salt meat—by indications of the space and specimens of the fruits which they had to offer to an over-crowded continent! It was one of the drawbacks to the testing here the substances used as food, that the visitor was not allowed to try them by the sense to which they especially appeal. We can, therefore, report only from sight; and, so far as that enabled us, with regard to the United States' exhibition of these articles, we may say that the samples of wheat, maize, and other grain, indicated at once the fertility of the soil and the good management of the farms on which they were grown.

It is not our intention to speak generally of the substances used as food which were to be found throughout the various divisions of the great Exhibition, but more particularly of Class III., according to the catalogue. First, let us take those from the vegetable kingdom. In this department were found a very extensive series of cases and fittings devoted to a display of the vegetable substances used in food, medicine, and the arts from Scotland. This Scotch exhibition was almost an epitome of the raw pro-

duce of the vegetable kingdom throughout the British islands, as there are few things of any use that will grow in any other part of this country that will not grow in Scotland. These specimens, which had been got together by the Messrs. Lawson and Son, of Edinburgh, were regarded with interest on account rather of their completeness than of their rarity. Here we had the various cereal grasses of Europe, as wheat, barley, oats, rye, &c., and the varieties which are commonly grown in Scotland, or which are produced in that country as used in other parts of the world. Not only were there exhibited the grains or fruits of those plants which are employed and the various substances which are manufactured from them, but we had dried specimens of the plant in blossom, and during the time of the ripening of its fruit. The various kinds of farm and garden produce used for food were also represented here. In cases where the vegetable substance could not be kept or dried, wax casts were substituted. Thus, we had a series of specimens of roots, as carrots, turnips, &c. Casts also of rare specimens of curious forms, and of the varieties cultivated were exhibited. The grasses grown and used as fodder for animals were shown on the same scale. On either side of the entrance to this Scotch compartment in the south gallery were found two living specimens of an interesting grass, the Tussack grass (*Dactylus cespitosus*), a native of the Falkland Islands, which have been grown in the Western Hebrides, and have produced flowers and seeds, so that it may be hoped this valuable grass may be shortly naturalized amongst us.

Most of our native British plants which are used in medicine were also to be found in this collection. In the glass cases looking north were a series of blocks of wood in their rough and in their polished condition, with also dried specimens of the branches, leaves, and flowers of the plants that have yielded them. Those who were anxious to gain a general view of the products of the vegetable kingdom in Great Britain, might have referred with unhesitating satisfaction to this collection of Scotch vegetable pro-

ducts. Of the agricultural produce, generally, exhibited in this department, we may say that there were very fine specimens of wheat and barley, also of malt. The Messrs. Gibbs and Co. had a large space devoted to them for the display of various agricultural seeds. We did not observe anything new in this collection; but it was found of interest to the practical agriculturist, as affording a view of the seeds employed in British agriculture at the present day. We were sorry, however, to be obliged to find fault with the unsightly appearance of the table on which these seeds were spread, and with the enormous loss of space attendant on their arrangement, which, far from assisting in their examination, almost entirely prevented it. From barley and malt we naturally turn to hops; and here we found several specimens from various parts of England. In this department we observed some enlarged drawings of the hop fungus—a very destructive growth on the hop—by Dr. Plomley, of Maidstone. Had a like plan been generally adopted, we might have had some interesting observations on the diseased conditions of food which sometimes play such dreadful havoc, as in the case of the potato disease. In the chemical department we found a glass case illustrative of the making of beer in this country. It would, indeed, be a blessed time for this beer-drinking country if all its beer were made from the materials exhibited here. Malt on one side, hops on another, a glass cask of porter on another, and a glass cask of ale on the other, revealed the true receipt of how to make good beer.

Beer reminds us of the section of “intoxicating drugs, fermented liquors, and distilled spirits;” which, although some persons regard them as belonging to the class of poisons, were placed by the executive committee under the class “Food.” The distilled liquors and wines exhibited here must have been from “unusual sources.” There were, however, a few bottles of what, judging from the outside, looked like genuine champagne. Whether the grape be an unusual source for champagne or not,

there are few persons who will deny that rhubarb is: and amongst the few wines of the Exhibition, this rhubarb champagne deserves a passing notice. Vain, however, must be the hope of wine-makers to get any substitute for the juice of the grape until they shall meet with something which contains the same compounds as the berry of the grape. In this department, the lovers of tobacco might regale their eyes and nostrils with an exhibition of the various forms which that substance assumes for the indulgence of its admirers. Of course, smoking was not allowed; and the tobacco on the British side, in the form of snuff, was not in a condition to be applied to the olfactory nerve. But the snuffers were better off than the smokers in the Exhibition: for there were no frowning notices in seven different languages forbidding them to indulge in their favourite luxury,—and the liberality of the Portuguese exhibitors of snuff had provided for every visitor a pinch. We understand from those who are judges that this Portuguese snuff was very excellent, and likely to produce a sensation in the snuff-taking world.

From snuff and tobacco the transition is natural to tea, coffee, and chocolate. The exhibition of tea was quite on a small scale:—a few samples of the different varieties of black and green from Assam constituting all that was to be seen in Class III. We have not yet sufficiently explored India and China, to say what these countries might exhibit. The specimens mentioned are, however, interesting, as indicating that tea may be grown in our Indian possessions, and may ultimately become a source of great commercial advantage to ourselves, and benefit to India. In coffee there was more than was novel. One exhibitor separated a quantity of useless vegetable tissue from the coffee, and thus secured a purer form of the raw material. Dr. Gardiner, of London, has discovered that the leaves of the coffee plant contain *caffeine*, a principle identical with that obtained from tea-leaves, called *theine*. It is generally admitted that these principles are the source of the utility of both coffee and tea as articles of diet.

Dr. Gardiner proposes to dry the coffee-leaves, and use them as we do tea-leaves. As he has procured a patent for his process of preparation, we suppose we may expect shortly to hear something more of this discovery. In addition to coffee, we had several exhibitors of chicory; so that people may become acquainted with the appearance of that which in their coffee they appear so constantly to taste. The produce of the cocoa tree (*Theobroma Cacao*) had numerous exhibitors. The seeds of this plant contain an active principle called *theobromine*, in addition to a fixed oil and other alimentary substances. Ground down, these seeds form cocoa paste. Mixed with vanilla, they constitute chocolate. When sugar is added, the chocolate has an agreeable taste; and it is used very extensively as an article of diet in France. It is gradually finding its way into England; and various Paris manufacturers competed here for notice and favour from the English, who might be disposed to try this new food. Hitherto the English have too much regarded this substance as a substitute for tea and coffee. That it is so, there can be no doubt, as it possesses the principle *theobromine*; but it is something more, and contains nutritive ingredients which are not found in either tea or coffee. The Exhibition served to call more attention to chocolate as an article of diet. Before leaving this subject, we would call attention to some specimens of Paraguay tea (*Ilex Paraguensis*), which is the only substance that in any part of the world can be fairly said to compete with tea, coffee, and chocolate. It is curious that this plant is found to contain a principle identical with *theine*. It is used for making tea by the natives of South America. It would make a good and cheap substitute for tea in this country, but it is not allowed to be imported.

We extract the following notices from the juries' reports:—

PRESERVED ALIMENTARY SUBSTANCES.

It is impossible to over-estimate the importance of

these preparations. The invention of the process by which animal and vegetable food are preserved in a fresh and sweet state for an indefinite period, has only been applied practically during the last twenty-five years, and is intimately connected with the annals of Arctic discovery. The active measures taken to discover a north-west passage, and to prosecute scientific research in all but inaccessible regions, first created a demand for this form of food; and the Admiralty stimulated the manufacturers to great perfection in the art. As soon as the value of these preparations became generally admitted in cold climates, their use was extended to hot ones, and for the sick on board ship under all circumstances. Hitherto they had only been employed as a substitute for salt beef pork at sea, and, if eaten ashore, it was at first as a curiosity merely. Their use in hot climates, however, speedily became evident, especially in India, where European families are scattered, and where, consequently, on the slaughter of a large animal, more is wasted than can be consumed by a family of the ordinary number. The consumption of preserved meats became at once enormous; hundreds of tons are annually exported to the East Indies and all our colonial possessions, and many are consumed by our fleets. The cheapness of these preparations is most remarkable. This arises from the processes and materials for the cases being inexpensive, and from there being no waste of the meat: all that is good goes into the case, which is always filled. It is affirmed by the manufacturers and others, and probably with truth, that meat in this form supplies troops, and the fleet, with a cheaper animal diet than salt provisions, from avoiding the expense of casks, leakage, brine, bone, shrinking, stowage, &c., which are all heavy items, and entail great waste and expenditure; added to this, the damage of one cask of salt meat risks the loss of all its contents, whilst the meat canisters are, comparatively speaking, imperishable, and an accident to one occasions a loss of at most but from two to four pounds of food.

Several hundred canisters of meat were exhibited from various countries, and in some of these by many different persons. Their merits were tested by a selection from each: the cases were opened in the presence of the jury, and tasted by themselves, and, where advisable, by associates. The majority are of English manufacture, especially the more substantial viands; France and Germany exhibiting chiefly made dishes, game, and delicacies—of meat, fish, soups, and vegetables. The jury desire to draw attention to the fact of viands of this description being extensively prepared in Australia, Tasmania, the Cape of Good Hope, Canada, &c., of equally good description with the English. Animal food is most abundant and cheap in some of those colonies. In Australia, especially, during seasons of drought, it is wasted in extraordinary quantities; flocks are slaughtered for the tallow alone, and herds for their bones and hides. Were the meat on these occasions preserved, it cannot be doubted that it could be imported into England, and sold at a cheaper rate than fresh meat in our metropolitan markets, to the great benefit of the lower classes. Among all the preparations exhibited by France, England, &c., there is no perceptible difference either in the mode or perfection of preservation. To seal, hermetically, full tin canisters is the general principle adopted; and it is effected by plunging them in boiling water, and soldering; a small orifice left purposely, by which all the air is expelled; this principle, variously modified, being the same throughout.

The contents of all the cases, of whatever kind, have lost much of the freshness in taste and flavour peculiar to newly-killed meat; they are always soft, and, as it were, overdone; the nutritious principles are, however, perfectly preserved. As nutriment, they are unexceptionable; they are wholesome and agreeable, and often pleasantly flavoured. Vouchers were given for some of the samples tasted by the jurors having been preserved for twenty-five years and upwards: these were in a perfectly sound state, and did not perceptibly differ from the con-

tents of canisters only a few months old. So long as the sealing remains sound, the viands appear to undergo no change. Any difference between the contents of the properly-prepared cases is to be attributed to the state of the food before preparation, or to the cooking, and not to the method employed for preserving, which is simple and universally applicable. Vegetables, preserved in a similar manner, have been considered by the jury with the animal food. Generally speaking, their flavour is fresher than that of the meats; especially in the case of those abounding in saccharine principle, as beet, carrots, parsnips, salify, which preserve to advantage. The more farinaceous do not preserve so well, such as green peas, &c.; whilst those abounding in volatile oils are hardly worth preservation at all (especially cabbages, turnips, and celery), except as anti-scorbutics.

Mr. E. Mason's dried compressed vegetables demand especial notice, as shewing one of the remarkable discoveries of modern times in this branch of manufacture: they have been awarded a council medal. By Mr. Mason's process the most bulky, soft, and succulent vegetables are reduced to a fraction of their volume, and are preserved in a dry, indestructible state. After boiling for a rather longer time than usual, they are restored to something of their original form and consistence, retaining all their nutritious principles, and much of their flavour. Chollet & Co., the manufacturers of these preserved vegetables use only dessication and compression in the process, which is Mason's invention. According to a statement published in the "Comptes Rendus," as read before the Paris Academy, the vegetables are reduced seven-eighths in weight, and proportionally in bulk. They require to be boiled for one hour-and-a-half to one hour and three-quarters, and on cooling are found to have regained nearly all their evaporated juices. If, as the jurors have reason to believe, these preparations retain their good qualities for several years, they cannot be too strongly recommended to public attention. It would probably be necessary for

long voyages, that these square cakes be packed in perfectly dry casks or tanks as biscuits are. In the British Department, J. H. GAMBLE, and RITCHIE, and McCall exhibit very fine samples of preserved viands and vegetables, and to each a prize medal is awarded for excellence of material and preservation. Ritchie and McCall's deserve especial notice for the great size of the pieces of meat, combined with all the firmness of texture that is attainable. All are said to be prepared by Goldner's process, the results of which are equal, but not superior to the ordinary process, as far as the jury could decide, after a very protracted examination and comparison. A preserved pig, entire, a conspicuous feature in the English Department, deserves notice as a remarkably successful instance of curing on a large scale.

CANADA deserves a very prominent mention for the abundance and excellence of the preserved viands exhibited; but all are of the ordinary description of cured meats, and none have any particular merit or novelty to entitle them to reward, except the hams of G. REINHARDT, of Montreal, which have been awarded a prize medal. There are barrels of beef, pork, and tongues, cases of smoked hams, bacons and sausages, kegs of lard, &c., all produced at a remarkably cheap rate." Numerous other articles were noticed by the jury, some with honourable mention, and some with the distinction of prize medals. Excellent preserved salmon was exhibited by NEW BRUNSWICK and NOVA SCOTIA; preserved fresh meats from AUSTRALIA in all respects equal to the English; admirable boiled mutton in tin cases by the NEWCASTLE PRESERVING COMPANY, no whit inferior to the English. VAN DIEMEN'S LAND sent excellent hams and preserved meats; NEW ZEALAND furnished dried mullets, while store of salt beef and pork travelled to the general mart from the CAPE OF GOOD HOPE. In short, the abundance of good cheer that was displayed on every side, would have more than sufficed to furnish a hundred such bridal feasts as were spread out by the rich Comacho before the wonder-

ing eyes of the delighted Sancho Panza, as the illustrious Cid Hamet has recorded in his most entertaining history.

Of a more *recherché* and delicate quality were the contributions from the land of the Gaul, the land of exquisite cookery and scientific *gourmandise*, differing from those of England, being articles of luxury rather than of common use. Meat, fish, and vegetables, with their various combinations of savoury sauces were delicately offered to the taste of the experienced connoisseur. AUSTRIA supplied a *quantum suff.* of solid fare, hermetically sealed, and moreover dispatched a flight of preserved larks, which obtained honourable mention from the gentlemen of the jury. SPAIN acquired a prize medal for her hams of Montanchis, sent from the BOROUGH OF AVILES. D. H. CARSTENS, of Lubeck, had a prize medal awarded to him for his tin cases of provisions. SWITZERLAND, with the thrifty economy natural to her people, exhibited fish and meats, dried and preserved in a fresh state by simple dessication, a remarkable peculiarity, and one which obtained a prize medal for the inventor, H. BAUP. The specimens, however, wanted flavour, and were discoloured, although perfectly fresh and sweet. Simplicity and cheapness were the great recommendations of these articles. RUSSIA exhibited fish, apparently in excellent condition. The UNITED STATES were unrivalled in their display of hams, which were declared by competent judges to be unsurpassable. Two prize medals testified the approbation of the jury on this subject, to CHARLES DUFFIELD, of Louisville, and SCHOOLEY and HOUGH, of Cincinnati. The *cream*, however, of American produce, was the meat-biscuit of GAIL BORDEN, a more concentrated food than which was never brought before the public. The exhibitor combined the best wheat flour with the nutriment of the finest beef, and presented them for use as food in the form of a dry, inodorous, flat, brittle cake, which will keep dry for an unlimited period. It only requires hot water and seasoning to the taste to produce a first-rate, agreeably-flavoured, highly-nutritious soup, somewhat of the con-

sistence of sago. One pound of the biscuit grated, and boiled in a pint of water, forms a rich nutritious soup. It is averred by the inventor, and he was supported by authority satisfactory to the jury, that ten pounds of this substance, with a proper allowance of water, afford, both in bulk and nutriment, food sufficient to support the physical and mental powers of a healthy working man for a month. A council medal was awarded to the inventor.

The osmazone exhibited by G WARRINER, is the nutritious matter or juice of meat, which is set free during the operation of boiling down fat for tallow in Australia. This is afterwards concentrated, and preserved in the form of sausages. A great amount of nutriment is thus obtained in a portable form, and when boiled with gelatine, it forms a palatable diet. The price is very moderate, one shilling per lb., and it hence commands a market, and is much used to form a gravy meat. The exhibitors declared that one pound weight is equivalent to the nutriment of thirty lbs. of fibrine, which argues a high economic value. Several specimens of preserved milks were submitted to the inspection of the jury. Of these, the concentrated preserved milk of E. D. MOORE, received a prize medal. It contains all the nutritious qualities, and much of the flavour of fresh milk. Russian caviare, of the finest quality, was exhibited by NIKITA VSEVOLODOWITCH VSIVOLOSJKY, and received honourable mention. Borneo and Singapore both supplied Trepang, or sea-slugs, in considerable abundance, no doubt a very delicate morsel, as we may also suppose are the swallow's nests, which the Chinese exhibited, of first-rate quality. Shark's fins, too, of which the Chinese are extravagantly fond, were also largely exhibited. Leaving these dainties, however, we arrive at the elegant manufacture of Nature's own artisans, whose unfailing excellence and chemical achievements no human art or industry has ever yet attempted to rival. Honey, from various quarters of the world, including that from far-famed Hymettus, was submitted to the inspection of the naturalist; and many specimens received prize medals

or honourable mention. The next article which attracted our attention was entitled "PREPARATIONS FROM BLOOD," and we confess it awakened in us somewhat of antipathy and disgust, familiar as our more homely tables have long been with the occasional display of—

"Black puddings, proper food
For warriors that delight in blood."

The jury, however, has succeeded in describing the dish as so dainty a one, so nutritive, and so economical, assuring us at the same time that its inventor, P. BROCCHERI, was deemed worthy of honourable mention, that we do not hesitate to promise that we will ourselves taste of his dish, should it ever come before us, and pronounce accordingly on its merits, or otherwise, as the case may be. ISINGLASS, as exhibited by Dr. MACCLELLAND, obtained the honour of a prize medal; and with this announcement we close our remarks on the important and popular subject of Food.

CHAPTER V.

WORSTED, ALPACA, AND MOHAIR MANUFACTURES.

EARLY USE OF WOOL IN ENGLAND—THE MOTHER OF ALFRED THE GREAT—EDWARD THE ELDER—FULLER'S CHURCH HISTORY—THE GOLDEN FLEECE—DUTCH WEAVERS—NORWICH—BRADFORD—HALIFAX—THE ALPACA—MOHAIR—RUSSIAN MANUFACTURE—FRENCH ARTICLES—ENGLISH MACHINERY—IMPROVED STATE OF SOCIETY.

The term "worsted stuffs," is applied to those manufactures, into the composition of which wool enters, that have undergone the process of *combing*, and includes those fabrics in which wool, thus combed, is combined with cotton and with silk. The name "worsted" is derived from

a village in Norfolk, where these goods were first produced. These fabrics are to be distinguished from "woollen cloths," the chief characteristic of which is, that they undergo the well-known process of "felting" or "fulling." In opening up a number of fleeces, a distinction is easily observable between the wool of short and that of long staple. The short wool, if examined by a microscope, is noticeable for the immense number of little feathery serrations, or imbrications on its surface, which enable the individual fibres to be locked into one another by the felting process; and this wool is accordingly most used for the production of woollen cloths. The longer wool does not possess these serrations to the same extent, and is better suited for combing, the object of which is to unravel all the fibres, and lay them smooth and even.

From the earliest times of English history, wool has always been regarded as our great national raw material for woven goods. The mother of Alfred the Great is described, like the virtuous woman spoken of in the Book of Proverbs, as busying herself diligently in spinning wool. Of Edward the Elder, an old chronicler tells us, that whilst "he sette his sons to schole, his daughters he sette to wool-werke." Nor was wool regarded with less favour by our early sovereigns as a means of replenishing the royal exchequer. No subsidies are more common as granted to the crown, than those on wool, and no articles more frequent subjects of legislative interference than wool and its manufactures. Amongst other instances of the wisdom of our ancestors it was at one time provided that no wool "should be sold by any man of Scotland, or to any other to carry into Scotland," under pain of life and member. A paternal government attempted to regulate the length, breadth, quality, and price of the cloth to be produced, and prescribed the wages and diet of the artificers.

There seems little doubt that the first great impulse to our manufactures from wool of all kinds was given by the prudence and patriotism of Edward III., who encouraged

cloth-workers from Flanders to settle in Norfolk, York, Kendal, and other places. It is scarcely to an ecclesiastical writer that we should look for manufacturing details; yet the witty Fuller, in the third book of his *Church History*, so pleasantly describes this event, that I am sure our readers will pardon us for transcribing the passage:—

“The king and state began now to grow sensible of the great gain the Netherlands got by our English wool: in memory whereof, the duke of Burgundy, not long after, instituted the order of the Golden Fleece; wherein, indeed, the *fleece* was ours, the golden theirs, so vast their emolument by the trade of clothing. Our king therefore resolved, if possible, to reduce the trade to his own country, who, as yet, were ignorant of that art, as knowing no more what to do with their wool than the sheep that wear it, as to any artificial and curious drapery; their best clothes then being no better than friezes, such their coarseness for want of skill in their making. But soon after followed a great alteration, and we shall enlarge ourselves in the manner thereof. The intercourse now being great betwixt the English and the Netherlands (increased of late, since king Edward married the daughter of the earl of Hainault), unsuspected emissaries were deployed by our king into those countries, who wrought themselves into familiarity with such Dutchmen as were absolute masters of their trade, but not masters of themselves, as either journeymen or apprentices. These bemoaned the slavishness of these poor servants, whom their masters used rather like heathens than Christians; yea, rather like horses than men! Early up and late in bed, and all day hard work and harder fare (a few herrings and mouldy cheese), and all to enrich the churls their masters, without any profit unto themselves. But, Oh! how happy should they be if they would but come over into England, bringing their mystery with them, which would provide their welcome in all places! Here they should feed on fat beef and mutton, till nothing but their fulness should stint their stomachs; yea, they should feed on the labours of

their own hands, enjoying a proportionable profit of their pains to themselves; their beds should be good, and their bedfellows better, seeing the richest yeomen in England would not disdain to marry their daughters unto them; and such the English beauties, that the most envious foreigners could not but commend them. Liberty is a lesson quickly conned by heart, men having a principle within themselves to prompt them, in case they forget it. Persuaded with the premises, many Dutch servants leave their masters, and make over for England. Their departure thence (being picked here and there), made no sensible vacuity, but their meeting here all together amounted to a considerable fulness. With themselves, they brought over their trade and their tools; namely, such as could not as yet be so conveniently made in England. Happy the yeoman's house into which one of these Dutchmen did enter, bringing industry and wealth along with them. Such who came in strangers within their doors, soon after went out bridegrooms, and returned sons-in-law, having married the daughters of their landlords who first entertained them. Yea, those yeomen in whose houses they harboured soon proceeded gentlemen, gaining great estates to themselves, arms and worship to their estates."

There is no doubt that the manufacture of worsted stuffs was introduced or improved at this time, for in the account of exports in the twenty-eighth year of Edward the Third's reign, we find mention of "8,061½ pieces of worsted, at 16s. 8d. per piece." The county of Norfolk became then, and continued for four centuries, the main seat and centre of the trade. So great, indeed, became the prosperity of the city of Norwich, that when Queen Elizabeth visited it in 1578, we are informed by the city records, that a grand pageant was exhibited, representing seven looms weaving worsted, russels, darnic, &c., with various devices; and that her majesty particularly examined the knitting and spinning of the children, perused the looms, and noted the several works and commodities that were made.

The manufacturing processes at this period were characterised by the most primitive and arcadian simplicity, and a degree of "slowness" which, in these railway times, we can scarcely realise. The work was entirely domestic, and its different branches widely scattered over the country. First, the manufacturer had to travel on horseback to purchase his raw material amongst the farmers, or at the great fairs held in those old towns that had formerly been the exclusive markets, or, as they were called, "staples" of wool. The wool, safely received, was handed over to the sorters, who rigorously applied their gauge of required length of staple, and mercilessly chopped up by shears or hatchet what did not reach their standard, as wool fit only for the clothing trade. The long wool then passed into the hands of the combers, and having been brought back by them in the combed state, was again carefully packed, and strapped on the back of the sturdy horse, to be taken into the country to be spun. For this end the West Riding manufacturer had not only to visit the villages in the immediate neighbourhood of Halifax, Bradford, &c., but used periodically to traverse the romantic hills and dales of Craven. Here at each village he had his agents, who received the wool, distributed it amongst the peasantry, and received it back as yarn. The machine employed was still the old one-thread wheel, and in summer weather, on many a village-green and hill-side, might be seen the housewives plying their busy trades, and furnishing to the poet the vision of "Contentment spinning at the cottage door." Returning in safety with his yarn, the manufacturer had now to seek out his weavers, who ultimately delivered to him his camlets, or russels, or serges, or tammies, or calimancoes (such were then the names of the leading fabrics), ready for sale to the merchant or delivery to the dyer.

It was in the year 1790 that the first spinning-jenny was put up in Bradford, in the private house of Mr. Gannett, a spinner, whose family still maintain a deserved eminence in the trade. Of course it was worked by hand.

About the same period similar machinery was introduced into Halifax and the neighbourhood. The first factory erected in Bradford was in 1793, and loud and manifold were the predictions of ruin that accompanied it. The extension of machinery and the improvement of mill-yarn advanced slowly but steadily. From a variety of causes, the manufacturers of Norwich did not avail themselves of the improved processes which the invention of the spinning-frame and the application of steam power brought out; and, consequently, the spinning of worsted yarn passed gradually from Norfolk to Yorkshire; in which latter county such improvements in machinery have subsequently taken place, as have enabled the manufacturer of that district to bring his goods into the market against the rivalry of the whole world.

In the year 1836 a new raw material was brought into use in the Bradford trade, destined speedily to become one of its most important features. The existence of an animal called Alpaca, half camel and half sheep, had long been known to travellers and naturalists, and, indeed, tradition reports that Pizarro had brought back specimens of its wool on his first return from Peru, together with textures made from it by the natives. But up to the period mentioned, this wool, as an article of commerce, had attracted little notice; and to Mr. Titus Salt, of Bradford, belongs the honour of having properly estimated its capabilities, and perfected its adaptation. The animal is of the Llama tribe, and is found only in the mountainous regions of the southern part of Peru, the table-land about four hundred miles from the sea-coast. It cannot live in the low lands near the sea. It is gregarious, but not kept in large flocks like sheep, and requires considerable care. The attempts to naturalize this animal in England have not hitherto been successful. His Royal Highness Prince Albert, with his characteristic patriotism and love of science, has paid much attention to its culture and adaptation to our climate; but his efforts have not realised the result we could have desired. The late earl of Derby's

flock, now in the hands of Mr. Salt, are thriving; but still it is doubtful whether the alpaca will ever become a stock animal in this country. The humidity of our climate is generally believed to be the main cause of our failure. Some years ago, six hundred alpacas were shipped from Peru to Liverpool; but so unskilfully had the arrangements been made for their accommodation, that only six survived the voyage. Alarmed at this shipment, the Peruvian government issued an edict, prohibiting their exportation for the future; and when, last year, some enterprising Australian colonists attempted to procure a cargo, they were obliged to return disappointed.

The wool, or hair of the alpaca is of various shades of black, white, grey, brown, &c., and is pre-eminently distinguishable for its brightness and lustre, its extreme softness, and great length of staple. A specimen, shown in the Great Exhibition by Messrs. Walter Milligan and Son, of Bingley, was forty-two inches in length; but this must have been of many years' growth. Considerable difficulties were at first experienced in the working-up of this material into yarn, but patience, perseverance, and skill, ultimately overcame them; and at the present time, in combination with warps of cotton or of silk, it forms an amazing variety of articles of great richness, softness, and beauty. The advance in its consumption may be estimated from the fact, that whilst, in the five years from 1836 to 1840, only 560,000 lbs. per annum were imported, last year the import had reached 27,331 ballots, or 2,186,480 lbs. weight: and the advance in price has been from 10*d.* per lb. in 1836, to 2*s.* 6*d.* per lb. in 1852.

Nearly contemporaneous with the introduction of alpaca wool, was the bringing into general use in Yorkshire of an article, similar in many of its properties—mohair, or goat's wool. This article is of very ancient use in manufactures, having been employed, as we are taught in the Book of Exodus, for the furniture and covering of the Jewish Tabernacle. The wool is grown in the neighbourhood of Angora, in the centre of Asia-Minor, and is

brought from thence on the backs of camels to Constantinople for shipment. It is singular that, although many attempts have been made to extend its growth beyond this immediate district, they have hitherto entirely failed. Formerly yarn was spun by hand in Turkey itself to a large extent, and exported to France; but English-spun mohair yarn has now entirely superseded it. The export of this yarn to France in 1850, amounted to 400,000 lbs; and in Germany its consumption is greatly increasing. It is manufactured in Yorkshire, chiefly into articles for ladies' dresses, of great softness, lustre, and brilliancy.

It will be readily conceived that the introduction of these new raw materials, added wonderfully to the capabilities of the manufacture, and increased immensely the number and variety of the fabrics produced. In the mean time, great improvements were made in machinery, and the result has been the opening of new branches of industry, and the quadrupling, within thirty years, the number of work-people employed. In the town of Bradford alone, the population has arisen within the last fifty years, from 13,264 to 103,782. The consumption of the various manufactures produced is immense. The total quantity of yarn spun may be estimated at about 57,000,000 lbs., which would require about 100,000,000 lbs. of fleece wool.

Among the many advantages of the late Great Exhibition, none was more striking than the opportunity it afforded of studying the comparative capabilities of our own and other countries. Englishmen were taught the useful lesson that we possess no monopoly of inventive genius or practical skill; and that to maintain our position, it is indispensable that we spare no effort, and relax no energy. "I had the honour and pleasure," says our able lecturer, "to serve as vice-chairman of the jury charged with the examination of the goods included under Class XII.; and, along with Mr. George Tetley, of Bradford; Dr. Hermann, of Bavaria, and Mr. Bernonville, of

Paris, I inspected the various fabrics produced by our own and the continental worsted manufacturers. The result of this investigation was, on the whole, highly creditable to English industry, whilst, at the same time it afforded useful suggestions for the future. It was curious and interesting to notice some worsted fabrics of great beauty, sent from Russia, a country we have never heretofore regarded in the light of a manufacturing rival. Amongst these were specimens of a cloth of great softness and fineness of texture, said to be spun and made by hand, from camel's or goat's hair, by the Bashkirs, a wandering and half-savage tribe on the banks of the Caspian Sea:—these were really wonderful, as showing what, after all, with the very simplest and rudest machinery, the human hand is capable of accomplishing."

It appeared to the jury that as to the fabrics composed of wool mixed with cotton, and the alpaca and mohair goods, there were no goods produced on the continent that could at all compete with the English manufactures. The second conclusion was, that whilst there were some Bradford goods of very fine qualities that were, of their particular description, unsurpassed in excellence of manufacture, yet that there were no double-twilled merinos of English manufacture exhibited; and that in these merino fabrics, and other goods designed for the use of the wealthier portion of the community, our French neighbours maintained their pre-eminence.

We must not forget to mention, while speaking of French manufactures, some figured or fancy goods from Roubaix, which were of beautiful design and exquisite workmanship. It is, indeed, in the department of design that our English deficiencies are most apparent; and no greater benefit could be rendered to the worsted trade than the introduction of a purer and more cultivated taste, not only among the producers, but also the consumers of our fabrics, by an extension and improvement of our plans of art-instruction; which is mainly to be done by indoctrinating the pupil with the true principles of art, and

placing before him specimens illustrative of the right application of these principles to the specialities of his own particular manufacture.

One point more remains to be briefly dealt with. We have seen the various improvements and inventions which, following each other in such quick succession, have brought the worsted trade to its present point of progress and prosperity. There can be no question that these have developed our national resources, and added to our national wealth; but what has been their influence on the great masses of the people employed in the manufacture? We know it may be said that the landowner has been benefited, for his rental has been largely augmented; that the farmer has derived great advantage, for his wool has been increased in quantity as well as raised in price; that the manufacturer himself has attained to wealth and eminence. But what have been their results, economically, socially, and morally, on the toiling thousands dependent on the trade for their daily bread?

We have described the processes of manufacture carried on towards the close of the last century, before the introduction of machinery and steam power. There are some persons who affect to look back upon that period with regret, and lament over the loss of domestic comfort, simple manners, and social happiness, which, they say, our manufacturing system has caused. And they delight to draw a glowing picture of the time when, amidst the quiet scenes of nature, far from the smoky town and the clatter of machinery, the spinner and the weaver followed their honest calling in the bosom of their families; not wasted in their physical strength by excessive toil, nor ground down to the dust by the rapacity of tyrannical masters, but earning a comfortable competency by moderate labour; not a turbulent, infidel, and chartist, but a contented, religious, and loyal peasantry.

Such a picture is a fable, not a fact. There can be no question, from all the records and traditions of the trade, that the physical comforts of the artisan have been vastly

increased, and his social position greatly elevated. In 1787, the average rate of wages was 3s. 3d. per week, when a stone of flour, weighing 16lbs., cost the working man from 3s. to 3s. 6d. At the present time, with flour at 2s. per stone, with other articles of provision reduced in proportion, with articles of clothing one-third at least of their former price, the average wages at Bradford of the factory-workers, men, women, and children, is 10s. per week. Nor is the amelioration in their social condition less real, although there is still great room for sanitary, for educational, for religious improvement. If there are grasping masters, men ignorant or regardless of their high moral obligations, they are the exception, not the rule. There are many noble "captains of industry," between whom and their work-people there is some other connexion than a mere money-payment; who study to promote their welfare and elevation, and whose efforts are met by a frank confidence and a grateful recognition. There are thousands of homes in the West Riding, where not only honest labour meets with its due pecuniary reward, but where comfort, cleanliness, and intelligence prevail; homes radiant with happiness, and many of them hallowed by religion.

We shall now, with all due acknowledgment, take our leave of the able lecturer from whose discourse we have selected the foregoing remarks, and, in concluding our present chapter, briefly remark that the jury, in testimony of their high approbation of the various specimens offered to their examination, awarded prize medals to no fewer than forty-seven exhibitors of worsted manufacture.

CHAPTER VI.

GLEANINGS AND REMINISCENCES

SECURITY OF PROPERTY—AMAZING POPULARITY OF THE EXHIBITION—A ROMANCE IN THE RUSSIAN DEPARTMENT—NOTABILIA—THE COLOSSAL CROSS—THE GREAT COAL—ITALIAN WONDER AND AMERICAN INGENUITY—HOUSE OF CAOUTCHOUC—THE PALETOT-BOAT—THE BRASS TAILOR.

UNDER this head we shall, from time to time, record such incidental events connected with the brief but glorious existence of the Crystal Palace as may, we hope, prove not altogether uninteresting to our readers. We shall also, without any attempt at classification, occasionally describe such of the more remarkable objects as, in the rich profusion that was everywhere scattered around, may have escaped our earlier attention. Indeed, such was the apparent inexhaustibility of that wondrous collection that, on a retrospective glance, the mind despairs of comprehending it as a whole; but now that the glorious vision has passed, now that the excitement has cooled, and visitors from foreign parts and quiet country places have reached their homes; now that the splendid trophies of human ingenuity and enterprise have returned to their respective owners, and that vast array of wealth and grandeur is dispersed, we begin to faintly realise the magnitude and purpose of the Great Industrial Bazaar.

The Exhibition of the Industry of all Nations having finally closed, we are enabled to look on its results as matters of history, and recall the various events of those eventful months with a somewhat calmer and more philosophic spirit. Two reflections arise out of the mass, which, above all the rest, will read the world a great lesson. The first, that thousands of people, gathered from every civilized corner of the earth, speaking different languages, brought up under different modes of government, exercising different forms of religion, and putting

faith in different creeds, passed daily through the noble edifice, not only without accident or mischief, but positively without inconvenience to themselves. The people were their own police; and the six millions went, and wondered, and departed in good-will and peace. History records no fact like this. Not less surprising or less suggestive, is the amazing thought that seventeen thousand exhibitors, who, like the visitors, were of almost every nation and kindred under heaven, entrusted the most valuable evidences of their wealth, their skill, their industry, and their enterprise, to the guardianship of some fifty policemen, armed with no better weapon than a wooden baton, and earning wages but little superior to that of the day-labourer. Day after day and night after night passed on, and no added force was requisite for the safety of the almost countless wealth deposited within those fragile walls. One can scarcely comprehend the strength of so much confidence and reliance on the law and order of Great Britain. In no other country of the world could such an exhibition of the industrial arts have taken place. Do we say this boastingly, or of a vain spirit? No; rather let us humble ourselves before the Throne of Mercy, and be thankful that it has been vouchsafed to us in our generation to lead the peoples onward in the march of peaceful enterprises and industrial triumphs.

The exceeding popularity of the Exhibition eventually became its greatest wonder, and many who went there to study the marvels of manufacturing skill could only gaze at the multitudes which they attracted to Hyde-park. There is a magnetic power about large masses gathered in one vast edifice, and swarming in happy excitement along spacious avenues, where their numbers tell upon the eye which eclipses every other spectacle, however splendid or interesting. Man is superior to the choicest examples of his handiwork, and never were vast assemblages seen in a situation more imposing. Those who witnessed the aspect of the building on a crowded shilling-day will not readily forget the strange and indescribable sensations

with which it inspired them. Who can say that we shall ever be able to witness such a sight again? It is not a small excitement which drags up humble provincials *en masse* from the country—which induced an old woman of eighty-four to travel on foot all the way from the Land's-end—which sent a bushel and a half of watches in one night to the shop of a single pawnbroker in Leeds, and which so stirred the heart of private benevolence throughout the kingdom that even our charity schools and the inmates of our workhouses, were largely represented at this Jubilee of Industry. On the ground, therefore, of popular excitement alone, few of us can expect to see the renewal of such a spectacle.

Books may supply us with the fullest information on the subject, but they can never touch the heart or stamp their lessons upon the memory like a personal inspection of this wonderful display. For ourselves we have always felt our powerlessness in dealing with the details of a collection so vast and comprehensive. An Exhibition which embraces every kind of industrial product cannot be grasped within reasonable limits, and a history of it, if attempted, would exhaust the patience of the most indefatigable reader. The bare classification of objects occupies eighteen closely-printed foolscap pages. The power of discussing advantageously each division of that immense classification involves a minute knowledge of every art to which the ingenuity and the labour of mankind have been directed, and is plainly impracticable. For the determination of excellence in each department the public may, however, be most safely and authoritatively referred to the awards and reports of the different juries. There are, notwithstanding, general results which it comes fairly within the province of the historian to point out; particular inventions, to indicate the importance of which justifies a special notice, and lessons of experience for the guidance of our future industrial career which ought not to be lost sight of. Many of these topics have from time to time been touched upon. Others may occasionally suggest

themselves ; and we shall endeavour to trace out the full significance of the objects that were brought before us, and gather up the threads of interest which the spectacle presented.

A ROMANCE IN THE RUSSIAN DEPARTMENT.

We have some doubts whether the Exhibition was ever so interesting in detail since the 1st of May, as it was within two or three days of the opening. Two days before it opened, the fulfilment of the pledge to the public appeared physically impossible. The place was strewn over with fragments and saw-dust, and boxes and cases, packed and unpacked. Hundreds of fittings had yet to be finished ; men were at work all over the counters, and up in the galleries, and on the roof, and over the floor ; and there were not twenty yards of the whole area of twenty-six acres that looked in such a state of forwardness, as to justify a hope that they could be got ready in time for the opening. By what magical arts all these difficulties were overcome, the confusion cleared up, the hangings swung, the cases unpacked, the counters dressed, and the vast superficies decorated, and put in order for the ceremonies of the inauguration, we know not ; and we are even sceptical as to the fact whether the people who accomplished these sorceries, are quite aware themselves how they did it.

The confusion of the last two days was singularly picturesque. You could see the costumes of all nations running about in a state of flutter and disorder, that elicited an infinite variety of temperaments—the flash of the tropics, the languor of the south, the gravity of the oriental complexion, and the rough bluster of the north. Some were impetuous and choleric ; whilst others, seated tranquilly on their unopened bales, waiting for instructions, looked on at the surrounding riot with imperturbable indifference. The incidents that were everywhere disclosed to you as you passed up the nave helped, also, to give a sort of dramatic interest to the scene, and to set you

speculating on the distant homes and associations of these people, and the community of pursuits and civilizing aims which had thus collected a multitude of men from the extremest points of the world under one roof, and for one express object. Little domestic under-plots, and quaint bits of pathos and fun, occasionally enlivened the bustle, or threw a scrap of pantomimic comedy into the silent corners of the Bazaar.

We remember an instance of this kind. It was just before the Exhibition opened, whilst most of the foreign departments were in a state of indescribable confusion. The Russian division was in the incipient stage of development; curious drums and trumpets, glittering ware and articles of northern *vertu*, had been delivered out of their boxes, and lay heaped about till the rest of the consignment should have arrived. There was a lull in the work; the men entrusted with the business were out, probably unpacking in the park; and the Russian chamber, in that condition of rich disorder, was left to the charge of a young girl. She was dressed town-fashion, and had none of the marks of the peasant about her, except a bright glow on her cheeks. She was handsome—that is to say, round-faced, with lively eyes, capable of a profound sentimental expression, (which seems, indeed, more or less common to all lively eyes,) and of a “comely shape.” You would have almost guessed her country from the cast of her features; yet, notwithstanding the Russian snow she came of, she gave you to understand at the first glance, that there was blood in her veins as warm as ever danced in Italy. If one could make anything substantial out of such a fancy, we might have imagined that she was a neighbour of that river, “whose icy current flows through banks of roses.” There she stood, keeping watch over the goods, and pretending to read a book. It was a mere pretence. From behind a temporary curtain suspended at the back, there peeped every now and then an English youth of one or two-and-twenty, with a dash of the juvenile *roué* in him, extremely

well-looking, and fairly set out for conquest. He appeared to be connected with some of the adjoining states, but it was evident that while his business called him to one place, his love of adventure had fascinated him to another. The coquetry that went on between them, would have had a telling effect upon the stage. Young as they were, they understood how to flirt books and curtains as skilfully as any *senhorita* of Seville or Madrid ever flirted a fan. Her look aside, to show her consciousness, as it were unconsciously, was perfect; and the way the young gentleman affected to be looking very seriously at something else, while he was all the time directing an intense focal light upon her ringlets (which she felt as palpably as if it had lifted them up), was a picture which, with the lady in the foreground, might be recommended to the consideration of Mr. Frank Stone, who always hits off these exquisite inchoate sensations with the most charming truthfulness. They did not understand one word of each other's language, yet had already contrived, by the aid of a third language, with which they were both familiar, to get up a tolerably intimate acquaintance. We are sorry we cannot tell our readers how it ended; we hope happily for both parties and that the lady did not leave her own inclement climate to find a more wintry region here! When the Romances of the Exhibition—with the Crystal Fountain for a frontispiece, as the trysting-place for lovers who want to lose other people and find themselves—come to be published, perhaps we shall have the sequel of this little incident.

NOTABILIA.

Lord Brougham and the Great Exhibition.—This learned lord, who was opposed to the erection of the Crystal Palace, became at length persuaded of its usefulness. In presenting Mr. Paxton's petition to the Lords, he said:—"He had the honour of presiding over the Society for the Diffusion of Useful Knowledge, and it was the inten-

tion of the society to present a petition in favour of this ally for the diffusion of knowledge. They considered it a serious rival to their adversary, the *gin palace*, because it would draw the people towards that which, whilst it entertained, also instructed, and must improve. He understood that two millions and quarter of persons had already visited the Crystal Palace, not more than one-fourth of whom had come from the country; and he could not help saying that, instead of seeing £2,500 a-day taken in shillings, he would rather see £200 received in pence.

Educational Adaptation of the Exhibition.—The proposition to make the Exhibition a means of popular education, by explanations and descriptive lectures, &c., has been most favourably received, and the University of Oxford not only countenances the scheme, but has given a series of lectures, in accordance with the idea in preparation for the general visit of the members of the University to the Exhibition. Professor Ansted has announced a series of eight lectures on successive Friday and Saturday mornings, between the hours of nine and twelve o'clock, in explanation of the mining processes, mineral products, and manufactures forwarded for exhibition from various parts of the world. The first of these lectures took place on Friday, the 23rd of May, and was of an introductory character—treating of the general nature of the materials of which the earth is composed. He then discussed, in their order, mineral fuel, iron, other metals, stone, clay, various earthy minerals and gems. The number of his class is limited, and a detailed list of the objects illustrated will be issued previous to each lecture. Lord Dufferin has suggested that a number of the pupils of the Belfast School of Design should be sent to London to have the benefit of seeing the Great Exhibition. His lordship has headed a list of subscriptions for the purpose with a contribution of £30; and it is hoped that his excellent suggestion will not only be carried out in Belfast, but that the hint will be taken by other schools of design also.

The Exhibition Post-Office.—A “post” was erected in the centre of the south half of the transept, after the fashion of such as are used in Belgium. It was a hollow cylinder (tastefully decorated, and in imitation of bronze), with a mouth similar to that of a common letter-box in this country; the post times being inscribed upon a ticket inserted in the top of the “post.” It was, we understand, intended to adapt this to the uses of the Exhibition establishment, which, we may here mention, included a post-office department, the business of which was very extensive, and was conducted by Mr. Osmond Jones. In this office, on an average, about 500 letters were dispatched daily, and about 300 arrived. Letters sent out were registered; and letters received were distributed to all the various parties engaged in the vast edifice. Posts arrived and left thrice a day—eleven, three and five. The Postmaster-general sent direct for the letter-bags, which did not pass through any branch office; and great accommodation was thus afforded to the public.

A graceful act of liberality on the part of his Royal Highness Prince Albert towards the young ladies, pupils at the Government School of Design, Somerset-house, is worthy of record. A few days before the opening of the Great Exhibition, the senior female students, several of whom were exhibitors,) prepared a memorial to Prince Albert, praying that they might be present at the inauguration of the “world’s fair” by her Majesty. The prince immediately replied to Mrs. M‘lan, the principal of the female branch of the school, regretting his inability to grant the free admissions required, but requested that the young ladies would accept a dozen season tickets, and that she would be pleased to present them to twelve of her most deserving pupils. Shortly after this communication from the prince, Mr. Redgrave, the principal of the male department, received from the Earl of Granville the following note:—“Bruton-street, April 29. Mr. Labouchere and I have much pleasure in offering twelve season tickets to the Government School of Design, if you will, with

the other head-masters, select those students who appear to you the most deserving. It will give *us* pleasure if these tickets give pleasure and instruction to those to whom you may allot them."

Purchases at the Great Exhibition.—Her Majesty among other acquisitions, purchased at the Exhibition a tiarra of sapphires of great lustre and size, and a brooch, consisting of two enormous rubies, set round with diamonds, by Lemonniere, of Paris. At a meeting of the Goldsmith's Company, a resolution was unanimously passed that the sum of £5,000 should be expended in the purchase of some of the magnificent plate exhibited at the Crystal Palace, for the use of the splendid hall. At a court of common council, Alderman Copeland brought forward a motion, "that a sum not exceeding £5,000 be voted from the city cash to purchase some of the works of art in the Exhibition of the Industry of all Nations, adapted for the decoration of the city of London."

A Commemorative Monument.—We extract the following from the columns of a popular journal.—(*To the Editor of the Daily News.*) SIR,—Your excellent article on the Exhibition in last Friday's paper has given much satisfaction to a large body of exhibitors, and all concur in the desirability of erecting a monument in commemoration, as suggested by you. Will you allow me to suggest another plan of doing this, viz., to purchase the Crystal Fountain—erect over it a temple, and let this be the memorial to coming ages, that on the spot occupied by it, thousands met each other "by appointment," during the great days of the Exhibition; and that it was not only the centre of attraction to many pilgrims who visited the building from afar, but the centre of the building itself. The commissioners might do a worse thing with a portion of their surplus fund than this, and their famous names might be engraved on brass within the portals of the temple itself. An inscription also should be placed there, showing how far east, west, north, and south the building extended from the centre, so that visitors might measure

with their "mind's eye" the grand proportions of the Palace of Glass.—I am, Sir, your obedient servant,
Crystal Palace, October 13. A LUCKY EXHIBITOR.

THE COLOSSAL CROSS OF THE GREAT EXHIBITION.

The public must remember the colossal cross, made of granite, which stood close to one of the entrances to the Great Exhibition, 1851. This immense piece of workmanship, which was hewn out of a solid block, and weighed upwards of ten tons, was brought over from Sweden, by an eminent merchant, named Carl August Kullgreu, who, falling sick and dying during the Exhibition, directed the cross to be placed over his remains, in the burial-ground of the Swedish church, Prince's-square, Ratcliffe Highway, which was accordingly done, and it there found its last resting-place. Its carriage from Hyde Park to its present site, cost £25. On the base is the following simple inscription:—"Carl August Kullgreu, born at Sweden in 1793, and died in London, 1851."

THE GREAT COAL AT THE EXHIBITION.

This large block of coal was drawn out of one of the pits in the Hange Colliery, Tividale, near Tipton, belonging to Mr. Daniel George Round. Upon the first attempt being made, such was the great weight of the coal that the niche ring upon which the rope is wound broke through in two places, it being cast iron, six inches broad and one inch thick. A new niche ring being put on, a second attempt was made, when, amidst great suspense, the coal was brought to light, up a shaft 200 yards deep, in the space of three minutes. The waggons being run over the pit the coal was landed amidst the shouts and cheers of all assembled. The coal was then transmitted, by an inclined railway, about 300 yards, to the wharf, the colliers holding it back by ropes. It had to be brought to the bottom of the pit some considerable distance; the ponderous mass at times breaking the cast-iron rails and

sleepers forming the railroad, as it moved slowly along. The weight of the coal itself, exclusive of any chains, &c., is about five tons, ascertained by means of steelyards. When lifted to be weighed, the hook by which the coal was suspended broke through, being of wrought iron, $1\frac{1}{4}$ inch square. The size is 6 feet high and 18 feet in circumference, necessarily of a circular shape to admit it up the pit shaft; the largest size that could possibly be produced, and probably the greatest weight ever attempted to be drawn out of a mine, and must have been attended with great risk to the machinery and ropes. No other than the thirty-feet or thick coal seam of South Staffordshire could allow of such a large piece of coal being produced. Its height, upon the skip and waggon, is nearly nine feet. It is a fine coal, remarkably bright and clear. It formed a very interesting addition to the Great Exhibition, and attracted great curiosity. It is worthy of remark, that the services of the men were gratuitous in getting the coal and sending it from the mine to the wharf, thus showing the good feeling existing between Mr. Round and his workmen.

ITALIAN WONDER AT AMERICAN INGENUITY.

We translate the following amusing notice from the *Giornale di Roma*, the daily oracle of the eternal city:—Let us, says the astonished writer of this article, take a brief survey of American eccentricities in the Crystal Palace. First of all cast your eyes upon that case—it is no larger than an ordinary portmanteau—open it, and you will find therein an entire house of *caoutchouc*, which you may erect, wherever your roving fancy may lead you, upon a very slight foundation, which folds up into the smallest possible compass, no bigger than an umbrella. All necessary furniture for the establishment is packed in the same case—to wit, an excellent elastic mattress which you may *blow up* at pleasure; small packets also, which with a *breath* you may convert into most commodious cushions. Is the evening fine and starlight—take that

long band—it may be easily inflated into a luxurious sofa, upon which yourself and your whole family may sit at ease. In the course of your peregrinations, do you suddenly encounter a broad river, whose waters bar your further progress? You may navigate the stream: lay hold of that *paletot*—you never met with its equal before—it is no bigger than an ordinary *Mackintosh*—you would take it to be one—you may see one like it every day in Hyde Park, or in the Champs Elysée; no dandy appears without one. But feel in one of the pockets, you will find therein a small pair of bellows; apply the tube to a little opening, and suddenly your *paletot* swells out, changes its shape, and in a trice is transmogrified, to all intents and purposes, into an excellent, serviceable boat. A couple of oars lie hidden at the bottom of the wonderful case—you embark, seating yourself upon the same serviceable case, in which your house is contained—you pass the river, and your canoe resumes its original form. According to the temperature of the atmosphere it either remains on your shoulders, or disappears into its hiding place;—from the *container* becoming the *contained*.

A little further on, you stop before a small brass machine, about the size of a quart bottle; you fancy it is a meat-roaster: not at all. Ha! ha! It is a tailor! Yes, a veritable *stitcher*. Present a piece of cloth to it: suddenly it becomes agitated, it twists about, screams audibly—a pair of scissors are projected forth—the cloth is cut; a needle sets to work, and lo and behold, the process of sewing goes on with a feverish activity, and before you have taken three steps, a pair of *inexpressibles* are thrown down at your feet, and the impatient machine, all fretting and fuming, seems to expect a second piece of cloth at your hands. Take care, however, as you pass along, that this most industrious of all possible machines does not lay hold of your cloak or great coat; if it touches even the hem of the garment, it is enough—it is appropriated, the scissors are whipped out, and with its accustomed intelligence the machine sets to work, and in a twinkling

another pair is produced of that article of attire, for which the English have as yet been able to discover no name in their most comprehensive vocabulary. See now, how, with this wonderful case and this most extraordinary machine, a man may travel far and wide without the aid of his fellows. Add only to this small quantity of luggage one of those steam ploughs lately invented by the English, with which six shares are readily set to work, and you may plough your field up in a jiffy. Is it not astonishing, to travel, sleep, be clothed and fed without apparent assistance from human hands?

CHAPTER VII.

PRINTING FOR THE BLIND, FROM THE JURIES' REPORT.

INVENTED IN FRANCE.—M. HAUY.—M. GUILLIE.—M. DUFAU.—
INSTITUTION AT VIENNA.—MR. GALL, OF EDINBURGH.—REV.
MR. TAYLOR, OF YORK.—DR. HOWE, OF THE UNITED STATES.—
PROGRESS OF THE DISCOVERY IN VARIOUS COUNTRIES.—STE-
REOTYPE OF THE HOLY SCRIPTURES.

THE jury have noticed with pleasure the large number of exhibitors from England, France, the Zollverein, and the United States, of inventions and devices for the instruction of the blind. It has been estimated that, in the European countries, one person out of every 1,200 or 1,400 of the entire population is blind, and in America, one in every 2,000. The great and increasing attention that is paid to the intellectual and moral instruction of this unfortunate class is one of the distinctive features of the progress of our age. A few years ago, printing for the blind was considered only a curious or doubtful experiment; but it is now established beyond all question that books are true sources of profit and pleasure to them.

Whilst embossed books have recently very rapidly increased, it is delightful to notice that the blind readers have multiplied far more rapidly. These circumstances have induced the jury to attempt a brief historical sketch of the origin and progress of printing for the blind, together with the present state of the art.

The invention of printing for the blind marks a new era in the history of literature. The whole credit of this invention, so simple, yet so marvellous in its results, belongs to France. It was M. Valentine Haüy, who, in 1784, at Paris, produced the first book printed with letters in relief, and soon after proved to the world that children might easily be taught to read with their fingers. It has been said by his biographer that he took his idea of embossed typography from seeing that Mademoiselle Parodis, a blind pianist of Vienna, who visited Paris that year, distinguished the keys of her instrument by the sense of touch, and also rapidly comprehended the maps in relief, which, a short time before, had been invented by M. Weisembourg, of Mannheim. After employing letters of different forms and sizes, and experimenting with the blind as to the precise shape of the letter that could be the most readily distinguished by the touch, he at length fixed upon a character differing very slightly from the ordinary Roman letter, or perhaps a little approaching italics. There was the usual mixture of the upper and lower case, the capitals taking more of the script form than the small letters. He submitted his first efforts and experiments to the Academy of Sciences of Paris. A committee was appointed to examine them, consisting of the Duc de la Rochefoucauld, M. Desmarets, M. Demours, and M. Vicq-d'Azir, and their favourable report on the 18th February, 1785, rendered his success a triumph. Great *éclat* attended the public announcement of this invention. A new institution was established, called the Institution Royale des Jeunes Aveugles, and M. Haüy was placed at the head of it. Among the books which he embossed were a grammar, a catechism, small portions of the church service, and

also several pieces of music. The printing of the music was inferior. The abbreviations which he introduced into his grammar, it has been said, did not afford sufficient advantages to counterbalance their inconvenience. His principal work is entitled *Exposé de differends moyens verifiés par l'expérience pour les mettre en état de lire à l'aide du tact, d'imprimer des livres dans lesquels ils puissent prendre des connaissances de langues, d'histoire, de géographie, de musique, etc.; d'exécuter différends travaux relatifs aux métiers.* Imprimé par les Enfants Aveugles. Paris, 1786, 4to. This celebrated essay was translated into English by Dr. Blacklock, the blind poet; and, in 1793, was published in London with his poems, in quarto. On the 26th of December, 1786, twenty-four of M. Haüy's pupils exhibited their attainments in reading, writing, arithmetic, music, and geography, before the king and the royal family at Versailles, who were delighted with the wonderful results. For a while all went on prosperously, but M. Haüy's friends soon began to give him credit for zeal rather than discretion in the management of his Institution, and consequently, as the novelty wore away, their admiration cooled, the funds fell off, and the institution languished until it was put upon a government foundation. The blind really received but little advantage from an invention that at first promised so much. The fault, however, seems to have been, not so much in the plan as in the execution of it. The books were bulky and expensive, and the letters, though beautiful to the eye, and clearly embossed, wanted that sharpness and permanence so essential to perfect tangibility; besides that, though the letters filled three spaces, they were too small to be well adapted to the sense of touch. Large editions of the few books printed were published, the idea having taken a strong hold of the public mind, so that, though the evil was soon perceived, it was not easy to abandon the defective alphabet and assume a better, for that step involved the sacrifice of all the previous labour. Hence this noble invention, except, perhaps, within the walls of the institu-

tion, soon sank into oblivion, and very little more was heard of it until 1814, when Haüy, having fallen into disrepute, was pensioned off on 2,000 francs a year, and Dr. Guillié, an active and enterprising gentleman, was made *Directeur-Général* in his place. Dr. Guillié soon revived the printing, and having considerably modified the letters, commenced the publication of a series of elementary and other works.

The mechanical execution of these volumes was exceedingly heavy. Most of them were ponderous folios, and very expensive; still they formed, for many years, almost the only literature of the blind, not alone in France, but in other countries. We should not omit particularly to mention the following book, which has come under our notice: *Notice Historique sur l'Instruction des Jeunes Aveugles*. Par M. Guillié, directeur-general de l'Institution Royale des Jeunes Aveugles de Paris. Paris, Imprimé par les Jeunes Aveugles, 1819, 4to, fifty-two pages, with seventeen lines to a page. Two leaves are pasted together, so that it is read as if embossed on both sides of a sheet. This is the second edition, the first having been embossed in 1817, the third in 1820, and a fourth edition, enlarged, in 1821. On page fifty-two is a curious specimen of printing in relief, in colour, so as to render the letters more easily read by the eye. This book was a valuable contribution to the library of the blind, but still retains nearly all the objections that were made to Haüy's first books; it can only be read by those possessing a very delicate touch. It is replete with information respecting the means then employed for the instruction of the blind in Paris; it proves, however, that the art of embossed typography had made but very little progress. It is singular that in this book no mention is made of the author's predecessor, Haüy, to whom, we should not forget, the idea of finger-reading is due.

Between the years 1821 and 1840 very little printing was done by this institution, except religious books, and music, after the system of notation by letters and ciphers.

L'Institut des Jeunes Aveugles de Paris, since its foundation in 1784, has at times been in a deplorable condition, but, about the year 1840, it underwent a thorough reorganisation, and is now, under the able management of M. Dufau, justly entitled to the front rank of institutions of this class in Europe, from its usefulness, no less than its age. A radical reform in the printing department has been made: M. Dufau has devised a system of types consisting of capitals and lower-case Roman letters, and has greatly improved the character of the embossing. The French books are now well embossed, sharp, clear, and durable. They have also been so much reduced in bulk that they are offered at a moderate price. M. Dufau has proposed to print a standard library for the blind, to consist of ten volumes in quarto, for elementary instruction, and ten volumes for higher instruction. The first series is nearly completed.

The second series of this library, not yet printed, it is to be hoped will soon follow. For the above lists, and other interesting information respecting the Paris typography for the blind, the jury is much indebted to a valuable pamphlet published by M. J. Guadet, entitled *L'Institut des Jeunes Aveugles de Paris, son Histoire et ses Procédés d'Enseignement*, Paris, 1850, 8vo, pp. 115. At Vienna an institution for the blind was established in 1804, but the jury is not aware of any printing having been executed in Austria before the year 1830 or 1831. About this date, the intelligent publishers, Treusinsky, of Vienna, embossed sheets with the Lord's Prayer in various languages, in Roman letters, and afterwards printed works for elementary instruction. The subject has been recently taken up by the imperial printing-office, and several volumes have been published, but the jury are unable to give a bibliographical description of them. In 1806, M. Haüy was invited to establish institutions for the blind at Berlin and St. Petersburg. His system of instruction was adopted in each of these institutions, and the books used were, for a considerable time, supplied from the press

of Paris. Both of these institutions, in a pecuniary point of view, were unsuccessful to M. Haüy, and, in 1808, he returned to Paris, and for a while resided in quiet with his brother, the celebrated Abbé Haüy. The jury have not been able to trace the progress of the printing for the blind at Berlin or St. Petersburg, but they learn that the amount of matter embossed in Germany, until very recently, did not exceed half of the New Testament. It was in Great Britain and in the United States that the first improvements were made in embossed typography; and only within the last fifteen years, that the blind generally have derived any considerable advantages from books. Before 1826, when Mr. James Gall, of Edinburgh, first began to turn his attention to the intellectual and moral education of the blind, it is believed that not a single blind person in any public institution of this country or America could read by means of embossed characters. To Mr. Gall is due the credit of reviving this art. With the most commendable zeal, patience, and perseverance, he canvassed the form of every letter, until at length he adopted his angular alphabet. He seems, from his own *Historical Sketch of the Origin and Progress of the Literature of the Blind*, Edinburgh, 1834, 8vo, pp. 388, to have experimented long and patiently with a great variety of arbitrary and Roman alphabets, with a view of finding one sufficiently simple and tangible for finger reading. On the 28th of September, 1827, he published *A First Book for teaching the Art of Reading to the Blind*; with a short statement of the principles of the art of printing as here applied to the sense of touch. Edinburgh, published by James Gall. This is believed to be the first book printed for the blind in the English language. It is a small oblong octavo volume, of nine pages, price sixpence, with four preliminary leaves, in which the author sets forth his "principles." The embossing is in high relief; and though it presents rather a rude appearance from the fact of its having been printed from wooden types, yet it soon rendered the practicability of reading by the blind a matter

of experience in Great Britain. Mr. Gall then issued sheets printed by metallic type, which were easily read by the pupils in the asylum at Edinburgh. Encouraged by his success, in March, 1828, he issued his prospectus for the publication, by subscription, of the gospel by St. John, but it was not until about the middle of 1829 that he perfected his alphabet to his own satisfaction. He tried three different founts of type—first, the double English size; second, the double pica; and, third, the great primer; and, after printing and cancelling sheets in each of these three founts, he at length, in January, 1832, finished the printing of his great work. The blind must ever feel indebted to Mr. Gall for the zeal and honest endeavour which he displayed in accomplishing what he thought would most benefit this unfortunate class. Notwithstanding the last sheet of his work was printed in January, 1832, yet it was not till October, 1834, that he was enabled to publish it. It is entitled *The Gospel by St. John, for the Blind*: with an Introduction, containing some Historical Notices regarding the Origin of a tangible Literature for their Use. By James Gall. Edinburgh: James Gall, 24, Niddry-street. 1834. In 4to. The introduction, in common type, comprises eighteen pages. The text, in embossed characters, consists of 141 pages, with twenty-seven lines on a page of seventy square inches. The leaves are not pasted together. The subscription price of the volume was one guinea, but it was subsequently sold for six shillings. Gall was very sanguine of the entire success of his noble enterprise; and, probably, had he chosen a less angular character, and one a little more resembling our common alphabet, as he has since done, he would soon have seen his books used in every institution in the country. His alphabet was the chief objection raised to his system. His printing was clear, sharp, and permanent; and his books, in every respect, were a great improvement on Haüy's and Guillié's. He published five or six other little elementary books in 1834, at the time he issued his chief work; but his system seems not to have come into extensive use. It

is to Mr. Gall, perhaps, more than to any other man, that the interest in the education of the blind was awakened throughout Great Britain and America. Nor has he allowed his exertions to flag. In 1837 he published *The Epistle of Paul the Apostle to the Ephesians*, printed for the Blind, in the largest type. The shape of the characters is similar to that in which the *Gospel of St. John* was printed, but instead of being smooth the letters are fretted or serrated. It is a small octavo volume of seventy-two pages, seventeen lines to a page; 250 copies were printed at the price of 1s. 6d. It is printed in the lower-case letters without capitals. *The Epistle to the Philippians* was also printed, in octavo, price 1s. 6d. The following year he again modified and improved his alphabet by bringing it back to a still greater resemblance to the common alphabet; but, unfortunately, he yielded to the suggestion of the Society of Arts of Edinburgh by introducing the use of capital letters at the beginning of sentences and proper names. His next book was *The Gospel according to St. Luke*, printed in the common alphabet, for the use of the blind, and capable of being read by any blind person, 1838. Printed for the British and Foreign Bible Society, London. Printed by James Gall, 22, Niddry-street, Edinburgh. This is a well-printed volume of 158 pages, twenty-eight lines on a page of seventy square inches: price 5s. The same year the *Acts of the Apostles* was printed in the same serrated letter, in 150 pages, price 5s. Besides these books, Mr. Gall printed a series of tracts for the blind, for the London Tract Society, in 1837, price 6d. each. It is a matter of surprise that these excellent and well-printed books of Mr. Gall are not more generally used. With the exception of the school at Abbey Hill, near Edinburgh, it is believed they are adopted by no public institution in Great Britain. It is still a question if the roughness of the serrated character possesses any advantage over the smooth, sharp embossing. Old and used books are frequently preferred by the blind to new and fresh ones.

While Mr. Gall was thus engaged at Edinburgh, the Rev. Mr. Taylor, of York, displayed an intelligent and active interest in the education of the blind. In 1828 he published the *Diagrams of Euclid's Elements of Geometry*, in embossed or tangible form, in 8vo. This was done on Bristol board, but was found too expensive. His mode of embossing, we believe, was forcing the paper, by means of heavy pressure, into the deep cut lines of a copper-plate. It was not successful. He published also a map of England and Wales. In 1836, he printed in raised characters *Selections of Psalm Tunes and Chants*, in oblong 4to. Also a short history of Elijah the Prophet, and of Naaman the Syrian; and the History of Joseph. The efforts of Mr. Alexander Hay, in the cause of embossed typography, deserve mention, although an entire failure. He devised an alphabet of twenty-six arbitrary characters, which, by certain combinations, could represent the abbreviations and double letters; so that in all he had fifty-eight characters. He procured types and other printing apparatus, and in 1828 or 1829, issued a prospectus for publishing the *Gospel of St. Matthew*, at 7s. 6d. The book was never published. The public interest in the blind became so great, that in 1832 the Society of Arts of Edinburgh offered a gold medal of the value of £20, "for the best communication of a method of printing for the blind;" and the result was, that between the 9th of January, 1832, and the 25th of February, 1835, no less than nineteen different alphabets were submitted, of which sixteen were in a purely arbitrary character. The grand problem was to produce an alphabet that would unite cheapness and legibility.

While the puzzling question of an alphabet best adapted both to the fingers of the blind and the eyes of their friends was under warm discussion on this side of the Atlantic, Dr. Howe was developing his system at Boston, in the United States. In 1833, the Perkins' Institution for the Blind was established at Boston, and Dr. S. G. Howe, a gentleman distinguished through a long series of

years for his philanthropic labours, was placed at its head. As Gall had done, Dr. Howe took Haüy's invention as the basis of his system, and soon made those improvements and modifications which has rendered the Boston press so famous. He adopted the common Roman letter of the lower-case. His first aim was to compress the letter into a comparatively compact and cheap form. This he accomplished by cutting off all the flourishes and points about the letters, and reducing them to the minimum size and elevation which could be distinguished by the generality of the blind. He so managed the letters that they occupied but little more than one space and a half instead of three. A few of the circular letters were modified into angular shapes, yet preserving the original forms sufficiently to be easily read by all. So great was this reduction, that the entire New Testament, which, according to Haüy's type, would have filled nine volumes, and cost £20, could be printed in two volumes for 16s. Early in the summer of 1834 he published the *Acts of the Apostles*. Indeed, such rapid progress did he make in his enterprise, that by the end of 1835 he printed in relief the whole of the New Testament, for the first time in any language, in four handsome small quarto volumes, comprising 624 pages, for four dollars. These were published altogether in 1836. The alphabet thus contrived by Dr. Howe, in 1833, it appears, has never since been changed. It was immediately adopted, and subsequently became extensively and almost exclusively used by the seven principal public institutions throughout the country. It is now the only system taught or tolerated in the United States, and deserves only to be better known in Great Britain and elsewhere, to be appreciated. In America, seventeen of the states have made provision for the education of their blind; and as universal education is the policy of the country, as well as its proudest boast, these books for the blind soon became in great demand. Dr. Howe, some time since, proposed a library for the blind; and, with a view of increasing the number of books as rapidly as possible, arrangements have

been made between the several institutions and presses to exchange books with each other, and not to print any work already belonging to the library of the blind. This harmony of action, together with the uniformity of the typography, presents so many obvious advantages, that the jury cannot but wish a similar system was pursued by the institutions of Great Britain and the continent of Europe.

It appears that, exclusive of three volumes not fully described in the list, 7,903 pages, containing on an average seventy-seven square inches, have been printed at the press of the Perkins Institution, or more than twelve times the quantity of matter contained in the New Testament. Almost all the books are stereotyped, and small editions are struck off as they are required. They are sold at the actual cost, the cost of the larger works being averaged on an edition of 250 copies. The above prices include the binding; fifty per cent. discount is allowed for books sold in sheets. The books are embossed in the institution under the superintendence of Dr. Howe himself, by means of a powerful press, built for the purpose. The sale of books in 1851 amounted to 427 dollars. This, however, is exclusive of the Scriptures. The American Bible Society, which now uses the stereotype plates of the Bible described above, distributed last year 149 volumes of the Bible. In short, the Boston books possess a neatness, clearness, sharpness, and durability of impression peculiar to themselves. The seventh volume of the *Cyclopædia* is already printed, and the jury learn with pleasure that the printing of the remaining volumes will be resumed and probably be finished in twenty volumes very soon. Want of funds is the temporary and only obstacle.

About the time that the Perkins Institution was established at Boston, another was set up in Philadelphia. A meeting of benevolent persons was called on the 21st of January, 1833, when arrangements were made to open a school for the instruction of the blind, and Mr. J. R. Friedlander was placed at its head. This school became the Philadelphia Institution for the Blind, by act of incor-

poration, 27th of January, 1834. The blind owe much to Mr. Friedlander for the Philadelphia contributions to their literature. On the 21st of November, 1833, he held the first public examination, and astonished the public by the progress of his pupils in reading, writing, geography, music, &c. The pupils read fluently from tangible letters executed by themselves with *pin types*. These were small pieces of wood about two inches long, having a letter cut in relief on one end, and the same letter formed at the other by steel points. Maps of the world and of the United States were also exhibited, made by perforating the outline from behind. The result of this exhibition was highly satisfactory. In his address, Mr. Friedlander set forth the great advantages that would accrue to the blind by a general system of instruction. He repeated the usual unanswerable arguments against the adoption of arbitrary characters, and stenographic or phonetic systems, and strongly recommended the use of our own alphabet. He followed, generally, Haüy's plan of instruction. Early in 1833, Jacob Snider, a young gentleman, a native of Philadelphia, applied his mind to the contrivance of a method of printing in relief. The alphabet at first adopted was a mixture of the upper and lower-case italics, and the relief was produced by heavy pressure on thick paper, between two sheets of copper, having the letters deeply cut. The embossing was thus on both sides. His first attempt, after printing a few elementary sheets, was on the Gospel of St. Mark, which he completed by the end of 1833, in a large quarto volume, and published early in January, 1834. An account of his first American book for the blind may be found in Poulson's *American Daily Advertiser* of the 10th of January, 1834. The four gospels were soon after printed in Roman capitals, but being found too bulky and otherwise objectionable, they were abandoned, and a smaller, more compact, and sharper type, in the Roman capitals, was adopted.

It appears that the Boston and Philadelphia institutions were founded almost simultaneously, and that their presses

and system of typography were established without being apprised of the efforts of each other. Time, however, has at length remedied this diversity. The typography of the Philadelphia books is exceedingly well executed, and compares most favourably with the best of the Glasgow books; but the press has ceased to work, and printing in capital letters will not probably be resumed. From the preference which the present distinguished and intelligent director of the Philadelphia Institution, Mr. William Chapin, late superintendent of the Ohio Institution, is known to entertain for the Boston system of typography, we may reasonably hope that, when printing shall be resumed there, it will be with Howe's alphabet. It is the opinion, however, of Mr. Chapin, that all the American institutions should unite, not only in the use of the same alphabet, but that they should all contribute to support one press. It may be remarked here, that the pupils in all the American institutions read fluently in both the upper and lower-case letters, but it is presumed that Philadelphia and Glasgow books will soon be entirely abandoned there; and, as the Boston books can now be obtained in London at a price cheaper than any of the five different systems of books printed in Great Britain, it is to be hoped that they will come into general use here. If it be thought that the letters are too small for adults to read with ease, books may be printed with larger types, and even then be less bulky and expensive than any of the systems in arbitrary characters now in use.

In the year 1848 or 1849, the Virginia Institution set up a press, and has since printed several elementary and school books. The Boston type is adopted, with the exception that capitals are used at the beginning of sentences and proper names. This alteration, in the opinion of the jury, is not an improvement, as the blind are thus compelled to learn two alphabets instead of one. The Virginia books are well embossed, and it is hoped that in future books capitals will be omitted. To the American Bible Society at New York much praise is due for their commendable

efforts in the circulation of the Scriptures among the blind. The stereotype plates of the Bible in six volumes, executed at the Boston press, under the superintendence of Dr. Howe, now belong to this society. They have printed a second edition from the same plates, and annually distribute, gratuitously, from 100 to 300 volumes. It had ceased to be a matter of surprise in the United States that the blind could read, before the public attention was loudly called to the subject in Great Britain; for we see that, in 1836, there were two active printing establishments for the blind in the United States; by one, the whole of the New Testament had been published in a cheap form, in the common lower-case letters; and by the other the four Gospels in Roman capitals. Let us now return to the Society of Arts of Edinburgh, and their prize medal, to which we have already referred. It was not until the 31st of May, 1837, that the society's medal was awarded. In 1836, when the nineteen different alphabets were before the committee of the society, circulars were drawn up and distributed, with specimens of the several alphabets; to the various institutions for the blind in England and Scotland, and every means employed to arrive at a correct result. The opinions of Mr. Taylor, of York, and Mr. Alston, of Glasgow, seem to have been those which the society chiefly followed. They were in favour of the common Roman capital letter, merely deprived of the seruphs, or small strokes at their extremities, and, accordingly, the prize was awarded to Dr. Fry, of London; and on the 31st of May, 1837, a medal was granted to him for the invention of an alphabet which appears to have been in use, since 1833, in Philadelphia.

On receiving the society's circular, in 1836, submitting the forms of all the competing alphabets to him, Mr. Alston was struck with the simplicity of Fry's, and immediately conceived the idea of making such alterations as he thought necessary, and putting it to the test. The changes made were simply to reduce the size of the letters and render the faces thinner. On the 26th of October, 1836, he

exhibited his first specimen of printing in relief in the Roman capital letter at a public examination of the blind. It was Fry's alphabet, slightly changed to improve the sharpness of the embossing. He then made a successful appeal for a printing fund. After great exertions and most commendable perseverance, he procured a printing press, with two founts of type, and the other necessary printing apparatus. In January, 1837, he issued a few elementary works. By March, 1838, he had made such progress, that the whole of the New Testament was printed in four super-royal quarto volumes; the type is great primer; and there are, in the four volumes, 623 leaves, of forty-two lines to a page. In December, 1840, Mr. Alston completed the printing of the Old Testament in fifteen super-royal quarto volumes, in double pica type. Of nine of the volumes he printed 200, and of the remaining six, 250 copies. There are in all these fifteen volumes, 2,505 pages, with thirty-seven lines on a page. Mr. Alston was justly proud of his great work, the entire Bible, containing the Old and New Testaments, in nineteen volumes. In his *Statement of the Education, Employment, and Internal Arrangements adopted at the Asylum for the Blind, Glasgow; with a short Account of its Founder, &c.*, tenth edition, 1846, 8vo, p. 80, he says, "this is the first bible ever printed for the blind;" but in this he was evidently in error, as we have shown that the greater part of it had long before been printed in Boston. We allude to these facts, merely because it seems a matter of much regret that Mr. Alston should have devoted so much enterprise and money in producing the Scriptures, when he might have ascertained that they had already been printed, and could have been bought at less money than it would cost him to print them. The main difference between the Glasgow and the Boston alphabets is, that one is in the upper and the other is in the lower case, which difference is certainly not of sufficient consequence to demand two editions. Had he expended the same energy and money in producing other valuable works, and exchanged them

with the Boston and Philadelphia Institutions, as he was urged to do, the three institutions would have been greatly benefited by the large outlay, and the blind of both countries would have had a great increase to their library. On the 18th of January, 1838, the officers of the Philadelphia Institution wrote to Mr. Alston, informing him that they possessed a printing press, and "understanding that you adopt the same character, it appears to our board of management that both institutions would gain by an interchange of volumes." Mr. Alston at once acceded to this proposition, and immediately shipped 150 volumes, being ten full sets of the New Testament, and fifty single copies of the gospels, besides multiplication tables and other works.

Since the death of Mr. Alston, on the 20th of August, 1846, the Glasgow press has almost ceased to work. A few of the volumes have been reprinted. It is at present engaged in reprinting the *Gospel of St. John* and the *Acts of the Apostles*. Since 1837, it has been almost the only press that has supplied England, Ireland, and Scotland with embossed books in Roman type. These books are typographically well executed, and the jury think Mr. Alston and the Glasgow press are deserving of great praise. The objections, however, to the small Roman capitals, in which most of the books are printed, are such that it is to be hoped that ere long this press will follow the example of that at Philadelphia, and adopt Howe's typography.

It has generally been supposed that the Glasgow press was the only one in Great Britain that printed anything of consequence in the common letter. But we cannot omit to mention a valuable work that has come under our notice; it is a *Magazine for the Blind*. London; Simpkin, Marshall and Co., Stationers'-court; price 6s.; in twelve monthly parts. 1839-40. After two volumes were printed, the first magazine for the blind in this country was discontinued. It is in quarto form, and has twenty-three lines on a full page. The type is the ordinary mixture of the upper and lower-case of Roman letter, and the

work is beautifully printed. The first volume contains seventy-eight pages, and the second seventy-three. It is to be regretted that so valuable a contribution to the literature of the blind should not have found better support. It consists of miscellaneous information, with fragments of authors, poetry, anecdotes, woodcuts, &c.

In 1806, an institution for the blind was established at Stockholm, and it is with pleasure that we learn that Mr. Watts, of Crown-court, London, has, at the expense of the British and Foreign Bible Society, printed in relief, with the ordinary Roman type, in capitals and lower-case, the *Gospel according to St. Luke*, in Swedish, for this institution. The volume was printed in 1848, and is a beautiful specimen of embossed typography. It is in quarto, consisting of 132 pages, twenty-seven lines on a page of seventy square inches. Price, as sold by the Bible Society, at cost, 6s. ; 500 copies were printed.

In France, Belgium, Prussia, Austria, Switzerland, Sweden, and the United States, the Roman lower-case alphabet is used. In most, if not all, of these countries, the institutions for the blind are supported and partially controlled by government, and perhaps this is the reason why, in all of them nearly, the same system of typography prevails. In Great Britain, however, the case is different. There are now five entirely different systems of typography in use here, and vigorously pressed upon the benevolent public. The unfortunate blind are thus deprived of the advantages they might have, if harmony of action and uniformity of typography were adopted. This diversity of opinion is causing great injustice to them, and the jury cannot but urge upon the parties concerned the speedy adoption of some one system throughout the country. Our opinion is decidedly in favour of Howe's American typography. Perfection is not claimed for this system, but it seems to us that there are fewer objections to it than to any of the others, and it may be the more easily improved ; but any one of the five principal systems now used in England is far better than so many. The present state of printing in

the Roman character in Great Britain, is, as we have seen already, that every press has been stopped, while the books in arbitrary characters seem to be increasing and gaining public favour. The principal of these is one known as Lucas's. It was devised by T. M. Lucas, of Bristol, about the year 1835. It consists of arbitrary characters, and is said to be founded on Byron's system of stenography. It is simple, speedily learned, and easily read by the touch, and is generally acknowledged to be, of all the arbitrary systems, the best. The printing on this system began at Bristol, and the following are the works published there:—1. *The Gospel according to St. John*, edited by T. M. Lucas, inventor of the system for teaching the blind to read by embossed stenographic character; July, 1837; Bristol: in 4to, sixty-six pages, and twenty-seven lines to a page. Two pages are pasted together.—2. *The Acts of the Apostles* (according to the authorised version), in T. M. Lucas's embossed stenographic character; 1838. Published under the direction of the Bristol Society for Embossing and Circulating the Authorised Version of the Bible for the use of the Blind; Bristol; in 4to, 118 pages, twenty-seven lines on a page.—(This second publication of Mr. Lucas was announced as containing some improvements: as widening the spaces and lessening the abbreviations.)—3. *The Gospel according to St. Matthew* (according to the authorised version), in T. M. Lucas's embossed stenographic character, 1839; published, &c.; Bristol; 4to, 116 pages.—(In this third publication is announced the firm conviction that this system will prevail over any other plan, on account of its tangibility.)—4. *The Gospel according to St. Mark*, &c.; Bristol, 1840; 4to, seventy-one pages. The above, with the exception of a few small elementary works, are, we believe, all that appeared at Bristol. In the year 1839, a society was formed, called "The London Society for Teaching the Blind to Read." They adopted Lucas's system, and have been gradually improving it. The following year the types and printing apparatus were transferred from Bristol to London; and

in 1841 the society issued *The Epistle to the Romans*. Since then their press has not been idle, and the printing is now done by the blind at the institution in the Avenue-road, Regent's-park.

In May, 1838, the "London and Blackheath Association for Embossing the Scriptures in various languages, and for Teaching the Blind to Read on the Phonetic System," was established. Its object is to stereotype the Holy Scriptures in James Hartley Frere's phonetic characters. About the year 1839, Mr. Frere devised a cheap plan for embossing or stereotyping. It consists simply of small wires, drawn with angles, laid down upon tin plates. The wires are bent, and cut by means of ingenious spindles to form the characters, which are similar to those of Gurney's system of short-hand. The wires are attached to the plate by heating it sufficiently to melt the coating of tin, into which the wire sinks, and is fast when cold. The common printing press is used in embossing. Mr. Frere's books are read from left to right and back, after the manner of the ancient Greek boustrophedon writing. Mr. Frere's books are well embossed, and from his plates the books can be printed as they are wanted. The objections to phonetic alphabets are obvious. Mr. Frere, however, does not claim to supersede the common spelling, or the common printing, or common embossing, but to form an easy introduction to them. More recently still, another system has been devised by Mr. W. Moon, master of the Brighton Blind Asylum. The characters are arbitrary, though Mr. Moon defines them as the "Common Alphabet Simplified." He claims also a new mode of stereotyping, by which the characters are rendered sharp and prominent. The lines are read forwards and back like Frere's plan, and it is even more bulky and expensive than his. The new mode of stereotyping is believed to be quite the same as Frere's, by means of wires laid on tin plates.

CHAPTER VIII.

ADDITIONAL REMARKS UPON PRINCE ALBERT'S MODEL HOUSES
—ESTIMATE OF THEIR COST—ORIGINAL IDEA OF THE GREAT
EXHIBITION BY PRINCE ALBERT—THE PRINCE'S REPLY TO
THE REPORT OF LORD CANNING.—BENNETT'S DESIGN FOR A
NATIONAL MONUMENT TO PRINCE ALBERT.

We have already in a earlier part of this work noticed at some length Prince Albert's Model Houses. The building was designed and practically superintended by Mr. Roberts, the honorary architect to the excellent "Society for Improving the Condition of the Working Classes," the president, Prince Albert, having supplied the means, and obtained the advantageous site on which it stood. The following additional particulars are from those drawn up by the architect:—"In its general arrangement the building is adapted for the occupation of four families of the class of manufacturing and mechanical operatives, who usually reside in towns, or in their immediate vicinity; and as the value of land, which leads to the economising of space, by the placing of more than one family under the same roof, in some cases, renders the addition of a third, and even of a fourth story desirable, the plan has been suited to such an arrangement, without any other alteration than the requisite increase in the strength of the walls. The most prominent peculiarity of the design is that of the receding and protected central open staircase, with the connecting gallery on the first floor, formed of slate, and sheltered from the weather by the continuation of the main roof, which also screens the entrances to the dwellings. The four tenements are arranged on precisely the same plan, two on each floor. The entrance is through a small lobby, lighted from the upper part of the door. The living room has a superficial area of about 150 feet, with a closet on one side of the fire-place, to which warm air may be introduced from the back of

the range; over the fire-place is an iron rod for hanging pictures; and on the opposite side of the room a shelf is carried above the doors, with a rail fixed between them. The scullery is fitted up with a sink, beneath which is a coal-bin of slate; a plate-rack at one end, drained by a slate slab into the sink, covers the entrance to the dust-shaft, which is inclosed by a balanced self-acting iron door. The dust-shaft leads into a closed depository under the stairs, and has a ventilating flue, carried up above the roof. The meat-safe is ventilated through the hollow brickwork, and shelves are fixed over the doors. A dresser-flap may be fixed against the partition. The sleeping apartments, being three in number, provide for that separation which, with a family, is so essential to morality and decency. Each has its distinct access, and a window into the open air; two have fireplaces. The children's bed-rooms contain 50 feet superficial each, and, opening out of the living room, an opportunity is afforded for the exercise of parental watchfulness, without the unwholesome crowding of the living room, by its use as a sleeping apartment. The parents' bed-room, with a superficial area of about 100 feet, is entered through the scullery—an arrangement in many respects preferable to a direct approach from the living room, particularly in cases of sickness. The recess in this room provides a closet for linen; and a shelf is carried over the door, with a rail fixed beneath it—a provision which is made in each of the other bed-rooms. The water-closet is fitted up with a Staffordshire glazed basin, which is complete without any wood fittings, and supplied with water from a slate cistern, in common, of 160 gallons, placed on the roof over the party and staircase walls. The same pipes which carry away the rainwater from the roof serve for the use of the closets."

With reference to the cost of construction, the following statement is made:—"In most parts of England the cost of four houses, built on the plan of this model structure, with ordinary materials, and finished similar to the ground floor apartments, may be stated at £440 to £480, or from

£110 to £120 for each tenement, contingent on the facilities for obtaining materials and the value of labour. Such dwellings, let at 3s. 6d. to 4s. a-week, would, after deducting ground-rent and taxes, afford a return of seven per cent. on the amount of outlay. Where hollow bricks are obtainable at a fair price, their use ought to effect a reduction of about 25 per cent. on the cost of the brickwork ; or equal on these four houses to about £40."

It is difficult to over-estimate the magnitude and importance of the effects of such a change as would be induced upon the population of the country, by the introduction of such dwellings as these for the poorer classes of the community ; whether as adding to their individual happiness, or improving their physical and moral condition, and thus rendering them more valuable and useful members of society. The jury unanimously recommended to the council that they should award the medal reserved to their gift to His Royal Highness Prince Albert, as the exhibitor of this most useful and interesting contribution to the exhibition, and to whom the nation at large is so deeply indebted for the promotion of this important subject. The claims of the prince to the original idea of collecting under one roof examples of the varied industry and talent of the whole world are so fully admitted that we need not advance them anew to our readers. In addition, however, to what we have already laid before them, numerous examples might be adduced of the interest taken by his Royal Highness with respect to the success of the Exhibition, which display with what unwearied zeal he constantly endeavoured to promote its advancement. A variety of objects of art, as well as of agricultural produce, were contributed by His Royal Highness, several of which received the award of prize medals, in testimony of the approbation of the jury. Many eloquent addresses were also delivered, on various occasions, by the accomplished prince, in furtherance of the views of the Great Exhibition. The testimony of His Royal Highness in favour of the support which had been afforded by foreign

countries to our great national undertaking, is in particular so well expressed, and contains so many true and beautiful sentiments, that we feel justified in laying it before our readers; and we shall accordingly transcribe it from the speech of His Royal Highness, in reply to the report of Lord Canning, on presenting the awards of the juries to the royal commission.

"It now becomes my pleasing duty," observed His Royal Highness, "on behalf of the royal commissioners, to deliver my most sincere acknowledgments and thanks for the hearty co-operation and support which the Exhibition has constantly received from foreign countries. The foreign commissioners who have left their own countries to superintend the illustration of their respective national industries at the Exhibition, have ever shown that desire to aid the general arrangements which alone has rendered possible the success of the undertaking.

"To the Society of Arts, which by its exhibitions of works of national industry prepared the way for this international Exhibition, the royal commission and the public feel that their acknowledgments are specially due, and the commission have to thank that body for having carried out the preliminary arrangements to an extent which justified me, as their president, in the application which I made to the crown for the issue of a royal commission. The commission have also to acknowledge the valuable services afforded by the eminent, scientific, and professional men, who, on the sectional committees, aided most materially in founding a scientific basis on which to rear the Exhibition. To the local commissioners and members of local committees, but more especially to those who have undertaken the onerous duties of secretaries, our best acknowledgments are also due. Without their zealous aid it would have been impossible to have obtained an efficient representation of the industrial products of their respective localities.

"And finally, we cannot forget that all the labours of those thus officially connected with the Exhibition would

have been in vain, had it not been for the hearty goodwill and assistance of the whole body of exhibitors, both foreign and British. The zeal which they have displayed in affording a worthy illustration of the state of the industry of the nations to which they belong, can only be equalled by the successful efforts of their industrial skill. The commission have always had support and encouragement from them during the progress of the undertaking, and they cannot forget how cheerfully they submitted to regulations essential for their general good, although sometimes producing personal inconvenience to themselves. If the Exhibition be successful in aiding the healthy progress of manufactures, we trust that their efforts will meet with a due reward.

"In now taking leave of all those who have so materially aided us in their respective characters of jurors and associates, foreign and local commissioners, members and secretaries of local and sectional committees, members of the Society of Arts, and exhibitors, I cannot refrain from remarking, with heartfelt pleasure, the singular harmony which has prevailed amongst the eminent men representing so many national interests—a harmony which cannot end with the event which produced it. Let us receive it as an auspicious omen for the future; and while we return our humble and hearty thanks to Almighty God for the blessing he has vouchsafed to our labours, let us all earnestly pray that Divine Providence, which has so benignantly watched over and shielded this illustration of nature's productions, conceived by human intellect, and fashioned by human skill, may still protect us, and may grant that the interchange of knowledge, resulting from the meeting of enlightened people in friendly rivalry, may be dispersed far and wide over distant lands; and thus, by showing our mutual dependence upon each other, be a happy means of promoting unity among nations, and peace and good will among the various races of mankind."

—"ALBERT."

We may here be allowed to observe, in testimony of

the high estimation in which the oratorical talent of His Royal Highness is held, the fact that his celebrated speech at the Mansion-house dinner was translated into several European and Oriental languages, and exhibited, among other specimens of fine printing, in the department appropriated to similar works in the Crystal Palace. In further evidence of the valuable nature of the services rendered by the Prince to the Great National Undertaking, we may quote the following passage from the juries' reports; and we trust that the wish therein expressed, that a statue of His Royal Highness should be erected on the site of the late building, in lasting token of the grateful acknowledgment of the nation, should at no very distant period be realised.

"The Jury of Class XXX.," says our learned reporter, "having brought their labours to a conclusion, cannot refrain from expressing their hope that steps may be taken for rendering the Great Exhibition as useful now it has ceased to be, as it has proved gratifying and instructive in the course of its short existence. It is the wish to see these hopes realized, that impels the jury, even at the risk of overstepping the strict limits of their functions, to submit, with great deference, their views on this point to the royal commissioners.

"The foundation of a permanent industrial museum in the heart of the metropolis of trade and industry, seems to the jury the logical and practical consequence of this Exhibition. It is in the "Crystal Palace" that the great truth has been impressed upon us, that art and taste are henceforth to be considered as elements of industry and trade—of scarcely less importance than the most powerful machinery. It seems also natural that this museum should, in the first instance, consist of the objects to which the several juries have called public attention as happy types and models for imitation. While such a museum, on the one hand, would be a lasting depository of industry and of the arts; it would, on the other, serve as the best and easiest standard of comparison by which human inge-

nuity might mark its progress, on the opening, ten years hence, of a new Great Exhibition; it would serve alike as a guide and as a beacon. Thus the Great Exhibition of 1851, which already stands out so prominently in the past, would bear fruitful and lasting consequences for the future, and would acquire an additional claim to a grateful record in the annals of mankind.

"The Greeks, our masters in the nobler arts, did not trust to the historian and the poet alone for the record of their achievements, but committed to the greatest artists the task of immortalising their military triumphs. The Great Exhibition deserves to be celebrated as the triumph of industry and invention over commercial routine and international jealousies. Whether the Crystal Palace shall be removed or not, posterity will look for some mark of gratitude to the illustrious prince to whom the present generation owe the realisation of a gigantic thought; a thought which may have floated in the minds of others, but which received consistency, and was brought to maturity by his energy and perseverance.

"The Jury of Class XXX., therefore, hope that on the site of the Exhibition Building a statue will be erected to Prince Albert. On its base should be recorded the share which statesmen and others have borne in bringing such an undertaking to completion. The Fine Arts would thus be called upon to perpetuate the memory of the Great Exhibition, to the attractions of which they have so variously and so powerfully contributed."

In anticipation of the foregoing wish, a design for a National Monument to Prince Albert was exhibited by Bennett, in the Fine Arts' Court. The design was square in plan. On the four sides were four large panel castings in relief, to commemorate the Industrial Exhibition of 1851, and the chief events connected therewith. The first represented the exterior of the Exhibition; the second, its interior; the third, the grand opening to all nations; and the fourth, the distribution of prizes. These compartments were intended to be twice the size of those

on the base of the Nelson column in Trafalgar-square, and to have sculptured figures in niches, on either side, to give the subjects of the castings in an emblematic sense, showing the noble intention of His Royal Highness relative to each; and at the extreme angles of the base, carried out as abutments, were sculptured blocks, upon which were illustrated the emblems of royalty and peace. Europe, Asia, Africa, and America, as emblematic figures, were seated at the four angles of the base; above which the globe of the earth was represented in polished granite, on which was placed a marble statue of the prince, in a metal temple, gilt, and dedicated to Prosperity and Fame, with the crown of England above, to denote the royal auspices under which the Great Exhibition had been so successfully accomplished.

CHAPTER IX

THE GENERAL BEARING OF THE GREAT EXHIBITION ON THE PROGRESS OF ART AND SCIENCE.

PROFESSOR WHEWELL—CRITICISM AFTER POETRY—POETRY OF
THE GREAT EXHIBITION—OBJECT OF CRITICISM—DIFFERENCE
BETWEEN THE ARTS IN ORIENTAL AND EUROPEAN COUNTRIES
—CLASSIFICATION, ETC., ETC.

WE extract the following able remarks from the Inaugural Lecture, delivered by the learned and philosophic Dr. Whewell, at the request of the Council of the Society of Arts, on "The general bearing of the Great Exhibition on the progress of Art and Science."

"It seems to me," observes the modest, though talented lecturer, "as if I were one of the persons who have the least right of any to address an audience like this on the subject of the Great Exhibition of the Art

and Industry of All Nations, of which the doors have so lately closed ; inasmuch as I have had no connexion with that great event, nor relation to it, except that of a mere spectator—one of the many millions there. The eminent and zealous men in whose wide views it originated, by whose indomitable energy and perseverance the great thought of such a spectacle was embodied in a visible, material shape ; those who, from our own countries or from foreign lands, supplied it with the treasures and wonders of art ; those who, with scrutinizing eye and judicial mind, compared those treasures and those wonders, and stamped their approval on the worthiest ; those who can point to the glories of the Exhibition, and say, '*quorum pars magna fui* ;—those persons may well be considered as having a right to express to you the thoughts which have been suggested by the scenes in which they have thus had to live ; but of these, I am not one. I have been in the Exhibition, as I have said, a mere spectator. Nevertheless, the Council of the Society of Arts have done me the honour to express a wish that I should offer to you such reflections as the spectacle of the Great Exhibition has suggested to me ; and, in deference to their wishes, and especially as a token of my admiration of the truly royal mind, which saw clearly, in despite of the maxims of antiquity, that there *was* such a royal road to knowledge, I shall venture to offer you a few remarks—which, precisely on account of the circumstances I have stated, may be considered as representing the views of an unconnected spectator of the great spectacle.

To write or speak the epilogue after any great and grand drama, is by no means an easy task. We see the confession of the difficulty in the very incongruity of the manner in which the task is sometimes attempted : as when, after the curtain has fallen upon a deep and solemn tragedy, some startling attempt at wit and pleasantry is uttered to the audience ; it may be by one of the characters whose deep sorrows or lofty aims we have been

following with the profoundest interest. You will, at least, on the present occasion, not have the difficulty of the task shown *in this manner*. Nor, indeed, is it my office, in any sense, to speak an epilogue at all. Perhaps such remarks as I have to make may rather be likened to the criticism which comes after the drama. For, as you know, criticism does come after poetry; the age of criticism after the age of poetry; Aristotle after Sophocles, Longinus after Homer. And the reason of this has been well pointed out in our time; that words, that human language, appear in the form in which the poet utters them and works with them for his purposes, before they appear in the form in which the critic must use them: language is picturesque and affecting, first; it is philosophical and critical afterwards: it is first concrete, then abstract: it acts first, it analyses afterwards. And this is the case, not with words only, but with works also. The *poet*, as the Greeks called him, was the *maker*, as our English fathers, also, were wont to call him. And man's power of making may show itself not only in the beautiful texture of language, the grand *machinery* of the epic, the sublime display of poetical *imagery*, but in those material works which supply the originals from which are taken the derivative terms which I have just been compelled to use: in the textures of soft wool, or fine linen, or glossy silk, where the fancy disports itself in wreaths of visible flowers; in the machinery, mighty as the thunder-bolt, to rend the oak—or light as the breath of air which carries the flower-dust to its appointed place; in the images which express to the eye beauty and dignity, as the poet's verse does to the mind; so that it is difficult to say whether Homer or Phidias be more truly a poet. That mighty building, then, along the aisles of which we have wandered day after day in past months, full as it was of the works of man, contained also the works of many who were truly makers; who stamped upon matter and the combinations of matter, that significance and efficacy which makes it a true exponent of the inward activity

of man. The objects there, the symbols, instruments and manifestations of beauty and power, were utterances,—articulate utterances of the human mind, no less than if they had been audible words and melodious sentences. There were expressed in the ranks of that great display many beautiful and many powerful thoughts of gifted men of our own and of other lands. The Crystal Palace was the cabinet in which were contained a vast multitude of compositions—not of words but of things, which we, who wandered along its corridors and galleries might con, day by day, so as to possess ourselves in some measure, and according to our ability, of their meaning, power and spirit. And now, that season of the perusal of such a collection of works being past; those days of wonderment at the creations of such a poetry being gone by; the office of reading and enjoying being over; the time for criticism seems to have arrived. We must now consider what it is that we have admired, and why; must try to analyse the works which we have thus gazed upon and to discover the principles of their excellence. As the critic of literary art endeavours to discern the laws of man's nature, by which he can produce that which is beautiful and powerful, operating through the medium of language; so the critic of such art as we have had here presented to us—of *material* art, as we may term it—endeavours to discern the laws of material nature; to learn how man can act by these, operating through the medium of matter, and thus produce beauty, and utility, and power. This kind of criticism appears to be the natural and proper sequel to such a great burst of production and exhibition as we have had to witness; to discover what the laws of operative power are, after having had so great a manifestation of what they do."

After an able exposition of the nature of these laws, the learned lecturer proceeds to descant on the "great and unique" opportunity we have had in the grand display of our late Exhibition, of taking a survey, at a glance, as it were, of the state of art in every part of the world. To

have inspected all these treasures in the various countries from whence they were drawn, would have been the work of a life, and of a long and laborious one; and would moreover have required the most felicitous combination of opportunity, wealth, and power. Whereas, as if by the magic influence of some fairy wand, the whole glorious spectacle has been presented to the wondering eyes of assembled multitudes in its crystal bounds; in the magic palace that, indeed, rose like an exhalation before their charmed sight. We had there collected examples of the food and clothing, and other works of art of nations in every stage of the progress of art. From Otaheite, so long in the eyes of Englishmen the type of gentle but uncultured life, queen Pomare sent mats and cloth, head-dresses and female gear, which the native art of her women fabricates from their indigenous plants. From Labuan, we had clothes and armour, weapons and musical instruments. From our wide Indian empire we had a profusion of contributions; from Singapore and Ceylon, Celebes and Java, Mengatal and Palembang. From Sumatra the loom, the plough, lacquered-work and silken wares; and from Central and Ancient India innumerable treasures of skill and ingenuity, of magnificence and beauty.

“And yet,” continues Dr. Whewell, “we perceive that, in advancing from these to the productions of our own form of civilisation, which has even in that country, shown its greater power, we advance also to a more skilful, powerful, comprehensive, and progressive form of art. And looking at the whole of this spectacle of the arts of life in all their successive stages, there is one train of reflection which cannot fail, I think, to strike us; viz., this:—In the first place, that man is by nature and universally, an artificer, an artizan, an artist. We call the nations from which such specimens came as those which I first mentioned, rude and savage, and yet how much is there of ingenuity, of invention, of practical knowledge of the properties of branch and leaf, of vegetable texture

and fibre, in the works of the rudest tribes ! How much, again, of manual dexterity, acquired by long and persevering practice, and even so, not easy ! And then, again, not only how well adapted are these works of art to the mere needs of life, but how much of neatness, of prettiness, even of beauty, do they often possess, even when the work of savage hands ! So that man is naturally, as I have said, not only an artificer, but an artist. Even we, while we look down from our lofty summit of civilized and mechanically-aided skill upon the infancy of art, may often learn from them lessons of taste. So wonderfully and effectually has providence planted in man the impulse which urges him on to his destination,—which is, to mould the bounty of nature into such forms as utility demands, and to show at every step that with mere utility he cannot be content. And when we come to the higher stages of cultured art—to the works of nations long civilized, though inferior to ourselves, it may be, in progressive civilization and mechanical power, how much do we find in their works which we must admire ; which we might envy ; which, indeed might drive us to despair ! Even still, the tissues and ornamented works of Persia and of India have beauties which we, with all our appliances and means, cannot surpass. The gorgeous East showers its barbaric pearl and gold into its magnificent textures. But is there really anything *barbaric* in the skill and taste which they display ? Does the Oriental prince or monarch, even if he confine his magnificence to native manufactures, present himself to the eyes of his slaves in a less splendid or less elegant attire than the nobles and the sovereigns of this our western world—more highly civilized as we nevertheless deem it ? Few persons, I think, would answer in the affirmative. The silks and shawls, the embroidery and jewellery, the moulding and carving which those countries can produce, and which decorate their palaces and their dwellers in palaces, are even now such as we cannot excel. *Oriental* magnificence is still a proverbial mode of describing a degree of

splendour and artistic richness which is not found among ourselves."

The learned master of Trinity then proceeds to describe the difference between the arts of "nations rich, but in a condition of nearly stationary civilization, like Oriental nations, and nations which have felt the full influence of progress like ourselves." "If I am not mistaken," says he, "the difference may be briefly expressed thus:—That in those countries the arts are mainly exercised to gratify the tastes of the few; with us to supply the wants of the many. There, the wealth of a province is absorbed in the dress of a mighty warrior; here, the gigantic weapons of the peaceful potentate are used to provide clothing for the world. For that which makes it suitable that machinery, constructed on a vast scale, and embodying enormous capital, should be used in manufacture, is that the wares produced should be very great in quantity; so that the smallest advantage in the power of working, being multiplied a million-fold, shall turn the scale of profit. And thus such machinery is applied when wares are manufactured for a vast population;—when millions upon millions have to be clothed, or fed, or ornamented, or pleased with the things so produced. This, therefore, is the meaning of the vast and astonishing prevalence of machine-work in this country: that the machine with its million fingers works for millions of purchasers; while, in remote countries, where magnificence and savagery stand side by side, tens of thousands work for one. There art labours for the rich alone; here she works for the poor no less. There the multitude produce only to give splendour and grace to the despot or the warrior, whose slaves they are, and whom they enrich; here the man who is powerful in the weapons of peace, capital and machinery, uses them to give comfort and enjoyment to the public, whose servant he is, and thus becomes rich while he enriches others with his goods. If this be truly the relation between the condition of the arts of life in this country and in those of others, may we not with reason and with gratitude say,

that we have indeed, reached a point beyond theirs in the social progress of nations?"

The learned lecturer then proceeds to the subject of classification, and after shewing the errors and deficiencies in classifying in the French *Exposition* of 1806, and the gradual improvement that took place in the succeeding ones till the year 1849, bestows great commendation upon the system that was adopted in the Great Exhibition of 1851, the superior advantages of which he very clearly points out. "I do not think," says he, "there is any presumption in claiming, for the classification which has been adopted in the Great Exhibition of 1851, a more satisfactory character than we can allow for any of those just mentioned, if we ground our opinion either upon the way in which this last classification was constructed, or upon the manner in which it has been found to work. And there is one leading feature in it, which, simple as it may seem, at once gives it a new recommendation. In the systems already mentioned there were no *gradations* of classification. There were a certain number, thirty-nine or five, nine or eight, of co-ordinate classes, and that was all. In the arrangements of the Great Exhibition of 1851, by a just and happy thought, a division was adopted of the subjects to be exhibited into four great *Sections*, to which other classes, afterwards established, were to be subordinate; these sections being, *Raw Materials, Machinery, Manufactured Goods, and the works of the Fine Arts*. The effect of this grand division was highly beneficial, for, within each of these sections, classes could be formed, far more homogeneous than was possible while these sections were all thrown into one mass: when, for instance, the cotton-tree, the loom, and the muslin, stood side by side, as belonging to *vestiary* art; or when woven or dyed goods were far removed, as being examples, the former of *mechanical*, the latter of *chemical* processes. Suitable gradation is the *felicity* of the classifying art, and so it was found to be in this instance."

We are next favoured with an able discussion upon the

immense advantage that will accrue to the world of science and of art, from the introduction of a coherent, sound, and graduated classification, such as was, in fact, adopted in the Great Exhibition; to the formation of which, we are assured in the *Illustrated Catalogue*, "eminent men of science, and of manufactures in all branches, were invited to assist in drawing each one the boundaries of his own special class of productions." And it was resolved, for the general purposes of the Exhibition, to adopt thirty broad divisions; of which classes, four were of Raw Materials; six of Machinery; nineteen of Manufactures; and one of the Fine Arts.

"There is yet," continues our eloquent lecturer, "one other remark which I should wish to make, suggested by the classification of the objects of the Exhibition; or, rather, a remark which it is possible to express, only because we have such a classification before us. It is an important character of a right classification, that it makes general propositions possible; a maxim which we may safely regard as well grounded, since it has been delivered independently by two persons, no less different from one another than Cuvier and Jeremy Bentham. Now, in accordance with this maxim, I would remark, that there are general reflections appropriate to several of the divisions into which the Exhibitions is by its classification distributed. For example: let us compare the first class, *Mining and Mineral Products*, with the second class, *Chemical Processes and Products*. In looking at these two classes, we may see some remarkable contrasts between them. The first class of arts, those which are employed in obtaining and working the metals, are among the most ancient; the second, the arts of manufacturing chemical products on a large scale, are among the most modern which exist. In the former class, as I have said, Art existed before Science; men could shape, and melt, and purify, and combine the metals for their practical purposes, before they knew anything of the chemistry of metals; before they knew that to purify them was to expel oxygen

or sulphur ; that combination may be definite or indefinite. Tubal-Cain, in the first ages of the world, was "the instructor of every artificer in brass and iron;" but it was very long before there came an instructor to teach what was the philosophical import of the artificer's practices. In this case, as I have already said, art preceded science : if even now science has overtaken art ; if even now science can tell us why the Swedish steel is still unmatched, or to what peculiar composition the Toledo blade owes its fine temper, which allows it to coil itself up in its sheath when its rigid thrust is not needed. Here art has preceded science, and science has barely overtaken art. But in the second class, science has not only overtaken art, but is the whole foundation, the entire creator of the art. Here art is the daughter of science. The great chemical manufactories which have sprung up at Liverpool, at Newcastle, at Glasgow, owe their existence entirely to a profound and scientific knowledge of chemistry. These arts never could have existed if there had not been a science of chemistry ; and that, an exact and philosophical science. These manufactories are now on a scale at least equal to the largest establishments which exist among the successors of Tubal-Cain. They occupy spaces not smaller than that great building, in which the productions of all the arts of the world were gathered, and where we so often wandered till our feet were weary. They employ, some of them, five or six large steam-engines ; they shoot up the obelisks which convey away their smoke and fumes to the height of the highest steeples in the world ; they occupy a population equal to that of a town, whose streets gather round the walls of the mighty work-shop. Yet these processes are all derived from the chemical theories of the last and the present century ; from the investigations carried on in the laboratories of Scheele and Kirwan, Berthollet and Lavoisier. So rapidly in this case has the tree of art blossomed from the root of science ; upon so gigantic a scale have the truths of science been embodied in the domain of art.

Again, there is another remark which we may make in comparing the first class, *Minerals*, with the third class; or rather with the fourth, *Vegetable and Animal substances used in Manufactures, or as implements or ornaments*. And I wish to speak especially of *vegetable* substances. In the class of *Minerals*, all the great members of the class are still what they were in ancient times. No doubt a number of new metals and mineral substances have been discovered; and these have their use; and of these the Exhibition presented fine examples. But still, their use is upon a small scale. Gold and iron, at the present day, as in ancient times, are the rulers of the world; and the great events in the world of mineral art, are not the discovery of new substances, but of new and rich localities of old ones,—the opening of the treasures of the earth in Mexico and Peru in the sixteenth century, in California and Australia in our own day. But in the vegetable world the case is different; there, we have not only a constant accumulation and reproduction, but also a constantly growing variety of objects, fitted to the needs and uses of man. Tea, coffee, tobacco, sugar, cotton, have made man's life, and the arts which sustain it, very different from what they were in ancient times. And no one I think can have looked at the vegetable treasures of the Crystal Palace without seeing that the various wealth of the vegetable world is far from exhausted. The Liverpool local committee have enabled us to take a starting point for such a survey, by sending to the Exhibition a noble collection of specimens of every kind of import of that great emporium; among which, as might be expected, the varieties of vegetable produce are the most numerous. But that objects should be reckoned among *imports*, implies that already they are extensively used. If we look at the multiplied collections of objects of the same kind, some from various countries, not as wares to a known market, but as specimens and suggestions of unexplored wealth, we can have no doubt that the list of imports will hereafter, with great advantage, be enlarged. Who knows

what beautiful materials for the makers of furniture are to be found in the collections of woods from the various forests of the Indian Archipelago, or of Australia, or of Tasmania, or of New Zealand? Who knows what we may hereafter discover to have been collected of fruits and oils, and medicines and dyes; of threads and cordage, as we *had* here from New Zealand and from China, examples of such novelties; of gums and vegetable substances, which may, in some unforeseen manner, promote and facilitate the processes of art? How recent is the application of caoutchouc to general purposes? Yet we know now—and on this occasion America would have taught us if we had not known—that there is scarcely any use to which it may not be applied with advantage. Again, how recent is the discovery of the uses of gutta percha? In the great collection were some of the original specimens sent by Dr. Montgomery to various experimentalists. Yet how various and peculiar are now its uses, such as no other substance could replace! And is it not to be expected that our contemporaries, joining the insight of science to the instinct of art, shall discover, among the various sources of vegetable wealth which the Great Exhibition has disclosed to them, substances as peculiar and precious, in the manner of their utility, as those aids thus recently obtained for the uses of life? Before we quit this subject, let us reflect—as it is impossible, I think, not to reflect when viewing thus the constantly enlarging sphere of the utility which man draws, from the vegetable world—what a view this also gives us of the bounty of Providence to man; thus bringing out of the earth, in every varying clime, endless forms of vegetable life, of which so many, and so many more than we yet can tell, are adapted to sustain, to cheer, to benefit, to delight man, in ways ever kind, ever large, ever new, and of which the novelty itself is a new source of delighted contemplation.”

But it is time to close our chapter and take leave of the learned Doctor, duly acknowledging the gratification and instruction he has afforded us.

CHAPTER X.

THE NAUTICAL DEPARTMENT.

GENERAL REMARKS — MODEL STEAM-BOATS — SHIPS OF WAR — SHIPS' MACHINERY — THE QUEEN MAN-OF-WAR — THE PIQUE, THE INCONSTANT, ETC. — GUN BRIGS — SAILING VESSELS — ABERDEEN CLIPPER SCHOONER — ROYAL YACHTS — GRAVESEND BOATS — MOYEN-AGE SHIPS — LIFE BOATS — THE NORTHUMBERLAND PRIZE LIFE BOAT — LIFE PRESERVING CONTRIVANCES — SIR W. H. HARRIS'S LIGHTNING CONDUCTOR.

THERE can, we apprehend, be little doubt in the opinion of all connected with, or interested in, naval art and the national science of ship-building, that Great Britain, in her maritime capacity, was not adequately represented in the Exhibition. If there was any one department of industry—any one national pursuit to which, more than another, the place of honour, in all the meanings of the phrase, ought to have been assigned, it was surely that connected with our much-boasted empire of the seas; we ought to have had a complete epitome of the naval architecture of the realm, and, if possible, also, a complete epitome (both by means of models, of course) of the history of ship-building in England from the earliest times; we ought to have been able to trace our progress from the days of the coracle and the primitive galley, founded, perhaps, in a great measure, upon Roman models, to the last screw-propeller man-of-war, launched from Woolwich or Plymouth, or the last crack yacht set afloat at Cowes. A few ancient models were certainly to be found in the naval gallery; we had a model of a Roman war-galley, with four banks of oars, very curious; and another of the famed ship of Henry VIII., which carried him to the conference of the Field of the Cloth of Gold; another of a first-rate, built in the time of Charles I.; and several of the not ancient, but old-fashioned, tubs in which Rodney and his sea-dogs won their battles. The collection

was, however, but fragmentary; we had only scattered links of the chain, which, if completed, would have formed one of the most interesting and purely national portions of the Exhibition. With these remarks, which we will not extend, we now proceed to describe the main features of the collection which was actually brought together.

It consisted, then, principally, of models of ships of war, showing their lines; and, in a few cases, of section models, showing the arrangements between decks. Many of the former class of models were in what may be called *bas-relief*—that is, only one side of the vessel was represented, the object simply being to show her mould and run. These were arranged upon the western wall of the Exhibition, and were principally representations of vessels constructed in our naval dockyards within the last twenty years, many of them having been built during the long contest which agitated the naval world between the surveyor of the navy and his numerous antagonists. There were also a fair number of models of steam-boats—some screw and some paddle—some in relief and others entire. A large passenger-ship or two were exhibited, showing some of the most recent improvements in interior arrangements; and, after glancing at a number of minor rigged models of schooners and cutters, introduced rather as specimens of the skilled neat-handedness of their builders, than as exemplifying any principles of naval architecture, we came upon a vast variety of plans and inventions for life-boats. On the other side of the stall on which the life-boats, of which we shall treat hereafter, made so conspicuous a figure, was arranged a great variety of models of ship machinery, particularly that connected with anchorage, such as capstans, windlasses, chains, and anchors themselves. We had then a number of compasses and graceful designs for binnacles; and, lastly, after inspecting an omnium gatherum of naval odds and ends, such as the gun-harpoons for striking whales, and almost equally formidable weapons for shooting ducks from punts, models of oddly-shaped ships with sliding keels, catamarans constructed

out of spars of wood, and air-tight bags acting as buoys, we came to an infinity of diving apparatus, illustrative of the entire process of adventuring, remaining, and working below water.

We will first briefly remark upon the bas-relief models of men-of-war. Had the set been complete, or had specimens of different ages been copiously given, the observation of the gradually shifting forms adopted in our dock-yards would have been specially interesting. As it was, however, we could gather from the collection hints not without significance. The first thing which strikes one in modern ship-building is the cutting down of the hulk, which our ancestors were fond of rearing above the water. The castles, quarter-decks and poops, with which they delighted to encumber their vessels, began first to give way at the bows; and the forecastle has long been a mere name, the thing having vanished more than a century ago. It was not, however, until a much more recent period that the mountains of timber piled up astern began to be reduced; and the naval battles in the latter third of the last century were fought by ships of the line with taffrails rising forty and sixty feet above the water. The tendency of improved ship-building is now to lay the whole expanse of deck as nearly as possible upon the same level. A few smaller vessels, we believe, have been actually built flush from stem to stern; but, at all events, the modest height of the quarter-decks now constructed contrasts strangely with the old notion of the symmetry and propriety of a towering poop, ornamented with all the art of the carver, and furnished with range over range of quarter galleries. Beneath the water-mark the tendency of advancing ship-building has been to adapt the curve of the swelling side and the concave portions of the ship, which, in nautical phrase, "take most hold of the water;" so as to prevent, as much as possible, the heavy and injurious rolling motion, which is increased by the quantity of weight a man-of-war must carry above the water to cause the ship to sit as stiffly as may be, and heel over as little as possible—the

special desideratum in a fighting vessel—and to arrange the lines of flotation so that the lowest tier of guns shall be carried at least three or four feet above the water line. To these divers qualities the naval architect has, of course, to add the considerations of that of speed, and the delicacy of the ship in answering the slightest touch of her helm. The peculiarities of modern improvement in all these respects are easily observable, upon comparison of an old-fashioned with a newly-built hull. The bows of modern men-of-war are sharper and far finer than the old style; and there is more of the concave shape about them—a form which flings the seas sideways and backwards instead of abroad, as the old bluff bows used to do: the belly of the ship is by no means so round as it used to be, the sides or walls being far flatter, an improvement which diminishes the tendency to roll; and the dimensions of the part of the ship immediately before the rudder, called “the run,” and in which the convex form changes into a pure and finely modelled concave, diminish so as to allow the body of water displaced to close quickly and easily, flinging its full force upon the helm. The spectator will observe that in modern ships this run is of larger dimensions than in the olden craft. An exception to this rule is, however, in some degree to be found in the vessels built under the survey of the navy. Take the *Queen* for example, a first class man-of-war of 116 guns: a full model of her hull was exhibited, which for bluntness, and, to modern eyes, clumsy ugliness of mould, could not be beaten by any of the ships which carried the flags of Byng or Rodney. The merits of the *Queen* have accordingly been long a fruitful theme of controversy in the naval world. Her best qualification is, we believe, that she carries her guns well out of the water; but she is slow, and rolls tremendously in a sea-way. In the lines shown of new frigates and gun brigs, it is curious to observe the approach to the style of building which has been long ago adopted in the construction of yachts—the bows sharper and finer than ever; “the runs” of great size and deli-

cacy of mould; and the height of the ship attaining its extreme point when measured from the taffrail to the lower extremity of the stern-post. The effect of this latter arrangement, taking into consideration that the ships in question are made to sit with the stern low in the water, is to cause them to draw many more feet of water aft than forward, to give them great steering power, and a strong, firm hold of the water. The attention of the spectator might be profitably directed to the models of the *Pique* and the *Inconstant*, two of our heavy first-class frigates. Of these, the former seems the more graceful; but the latter has proved herself the most efficient vessel. Both the *Pique* and *Inconstant*, however, belong to the old school. Our first-class frigates are now rated to carry fifty guns, and beautiful specimens of these are found in the models of the lines of the *Raleigh* and the *Arrogant*—two of the noblest ships on the water, and bigger than Lord Nelson's old seventy-fours.

After inspecting the new-fashioned men-of-war, furnished with auxiliary screw propellers, such as the *Hogue* and the *Agamemnon*—vessels carrying the most formidable batteries of cannon ever borne across the ocean, and no doubt destined to take a conspicuous part in our next naval war—if ever such a misfortune should arise—we may advantageously study the moulds of the little squadron of experimental gun-brigs, the evolutions of which excited so much interest some five or six years ago. There is no department of our naval architecture in which we have made more progress, than in the construction of the small men-of-war, called gun-brigs. The old vessels of this class were a disgrace and a reproach to our dockyards. Over-masted, deep-waisted, ill-modelled, they went down or went ashore with such sad regularity, that they acquired the significant nick-name of “coffins;” but were still—not much to the credit of successive governments—employed as packets, until the last of the fleet was either wrecked or worn out. Now-a-days, the gun-brigs form one of the most creditable departments of the navy. In

this department of the Exhibition we saw the models—and beautiful they are—of the fleet, built both by private and official enterprise, the peaceful records of whose cruizes filled so many newspaper columns half-a-dozen years ago. The precise question of their merits was never very fairly settled; but the general opinion was, that the *Mutiné*, the *Daring*, and the *Espiègle* were the flowers of the fleet. The *Mutiné* afterwards greatly distinguished herself on the coast of Africa. The *Flying-Fish*, one of the quickest of the squadron, was so wet, as seriously to interfere with the comfort of all on board; but still, altogether, the vessels in question formed, perhaps, the most beautiful and best adapted squadron which ever went to sea.

A few, but only a few, models of merchant sailing-vessels were exhibited. One of these was a perfect specimen of the latest improvements in first-class passenger-ships; we allude to the model of the hull of the *Owen Glendower*, one of Mr. Green's splendid fleet of frigate-like merchantmen, built at Blackwall. The capacity for stowage in this fine ship is beautifully combined with a faultless outward mould. Her bows are sharp, and have that slightly concave tendency which denotes speed and dryness, and the run is beautifully fine, and what sailors call "clean." In one respect the *Owen Glendower* differs from the new fashion of flush building, now so prevalent. She carries a quarter-deck not too high, but of more than ordinary length, and sufficiently lofty to allow an airy and comfortable cabin, with berths and state rooms to extend below it. Thus the passengers are accommodated upon the level of the main deck. They have plenty of air and ventilation. The height at which they stand above the sea allows of larger windows being formed than would be possible had they to descend a "companion" to attain their cabin, and thus a handsome airy apartment is secured, removed as much as possible from unpleasant smells, which are always the stronger the further down you go in a ship; while a considerable space is gained

beneath for extra stowage. A similar arrangement now very generally holds in the American packets; and different modifications of the same plan, such as round-houses, cuddies, and so forth, have been long familiar to the passengers of East India ships. Forward of the deck cabin, in the *Owen Glendower*, is an excellent arrangement of pens for live stock, and a compact cooking apparatus; while the crew are accommodated beneath a raised forecastle upon exactly the same principle as the passengers abaft.

Above Mr. Green's fine ship stood a rigged model of a class of vessels which is making great and rapid innovations on our old-fashioned mercantile marine—an Aberdeen clipper schooner. The port in question has taken the lead in the production of this very beautiful, very safe, and very fast class of vessel. Indeed, the Scotch ports on the eastern coast, particularly Leith and Dundee, stand conspicuously out for their excellence in constructing a new class of exceedingly elegant and exceedingly fast-going ships, which will, no doubt, gradually come into universal use. The "clipper" is constructed upon the general theory, that a small amount of stowage-room may be advantageously given up to secure a great amount of speed, and with that speed a preference for cargo and a greater degree of safety from the accidental risks of the sea; since no one can dispute that a vessel able to go ten or twelve miles an hour, stability not being sacrificed, must, in the nature of things, be a more secure ship in every respect than one which is able to go only five or six. The clippers were, we believe, first built to carry up perishable cargoes of salmon from Norway and the north of Scotland to the Thames. They are now commonly used in traffic for the conveyance of easily-spoiled goods, and for that of cattle, which are deteriorated in condition by being long at sea. The general fruit trade from the Mediterranean, the orange trade from the Azores, as well as the Scotch coasting traffic, are now almost entirely carried on by clippers—craft of as beautiful an appearance on the water, as any of

Cooper's slaving, pirate, or privateer schooners, and able to go from the Nore to the Humber in the time which a clumsy Newcastle brig would take to work down the Swin to Harwich. The fast increasing class of screw-propeller boats—principally devoted to traffic in cattle, between the Thames and Ireland, and Holland—are also built and rigged on clipper principles; and Aberdeen has recently been asserting her right still to continue in the van of the race in naval architecture, by building clipper ships of large tonnage, one of which, in a voyage from China lately, beat an American ship, loudly trumpeted as the fastest vessel which ever bore the stars and stripes—and consequently, of course, in the opinion of Yankee-land, the fastest in the world. The model in the Exhibition showed that the Aberdeen clipper schooners, while they are formed abaft much upon the ordinary moulding of a yacht—that is, as we have explained, with a long and fine run, and very high from the bottom of the stern-post to the taffrail—are modelled forward upon the principle of the bows of a Clyde steamer—involving great sharpness, rising into a concave shoulder of exaggerated hollowness, compared with that mere tendency to concavity that we have described as characterizing many new vessels, both men-of-war and merchantmen. The effect of this construction is not to prevent the vessel pitching, but to cause her to pitch without being wet; the overlapping portion of the bows flinging the water downwards and backwards from the obstacle, while the sharpness beneath enables the ship to slide quickly and steadily through the water. As yet, with few exceptions, the clipper-build is confined to coasting craft, but the initiative has been taken in the construction of large full-rigged ships upon the same principle; the success of more than one of which, sailing from Liverpool and Aberdeen, has lately formed the subject of newspaper paragraphs. Of the coasting craft, a few, but only a few, clipper brigs have been built, the majority of the smaller vessels being schooners. In the rigging, considerable improvements, both as respects light-

ness and elegance, have taken place. The clipper is less towering aloft than the old-fashioned hermaphrodite schooner; but her yards are squarer, her boom and gaff longer, and she is thus enabled to carry as great a spread of canvass and to manage the cloth with more facility than the loftier rigged vessels. The old hermaphrodite schooner carried fore-mast, fore-top-mast, and fore-top-gallant-mast, and occasionally even a fore-royal-mast, in all, four pieces. The clipper uniformly contents herself with a fore-mast and fore-top-mast, making up for the diminished height of the "stick," by the great squareness of the yards—the fore-top-gallant-yard being sometimes, if we mistake not, made to come down upon the fore-top-sail-yard, so as to compact the rigging and diminish the leverage of the swing of high and heavy top hamper. The clipper has, further, an air of smartness and ship-shape which the ordinary merchant coaster is far from pretending to. She can go at double the speed of the lumbering collier brig or coast schooner, and shows beside them, too, like a hunter compared with a couple of dray-horses.

The steam-boat models were numerous, and not uninteresting. A number of bas-reliefs were shown of vessels in the process of construction by Mr. Mare, for the General Steam Navigation Company—craft of beautiful design, and which will, no doubt, turn out very fast; and there was a half-model of a 2,000-tons steam screw-propeller yacht on the stocks, for the Viceroy of Egypt, which has since been launched, and which deservedly attracted a great deal of admiration. A large model of a new paddle-wheel steamer, fully rigged and complete, down to the minutest details of finish, was placed in a prominent position, facing the eastward-running inner gallery, and repaid minute inspection as a peculiarly perfect model of a first-class craft of her species. She was flush-decked and carried swivel signal guns upon her paddle platform. The floats of the wheels were disposed, not after the too common fashion, in a plane with spokes, but perpendicularly, so as to strike the water edgewise, and to

expend the whole force of the paddle upon a productive lateral, and not an unproductive downward movement. A number of contrivances, more or less ingenious, of feathering paddle floats were displayed, but we understand that it is found in practice that machinery of this sort, however theoretically plausible, and however supported by abstract scientific laws, has such an unfortunate tendency to get out of order, as to counterbalance the nominal advantages. With improved mechanical contrivances, however, it is quite possible that the feathering system may yet be made practically available—unless, indeed, the screw achieve the final overthrow of the paddle-wheel.

The models of the *Victoria and Albert* and the *Fairy*—the well-known royal yachts—excited much attention. We do not know, however, whether we are to place perfect credence in the miniature presentment of the larger vessel. Soon after the launch, it was pretty generally reported that she was a contemptible botch, and that all sorts of tricks and sly patching had been resorted to in order to make her sail respectably. Whether these stories were true or not, we cannot vouch, but it was often asserted, and never denied, that, as in consequence of some mistake in her lines, the *Victoria and Albert* went fastest when down by the head, she was ballasted so as to bring her into this position, and then built up upon, so far, of course, merely as the bulwarks went, and newly painted, to conceal her awkward sit upon the water. Be that as it may, however, the *Victoria and Albert* now goes very quickly through the water; a consummation for which she has, in some degree at least, to thank the immense steam power wherewith she has been provided. The *Fairy* is a sweetly formed and almost faultless little craft. Her speed in smooth water is wonderful, and the good weather she manages to make in rough, considering her shallowness, is equally marvellous. In crossing the Irish Channel in a gale of wind, the day her Majesty returned from Belfast, we are told that, except mere spray, she did not ship a couple of buckets-full of water, while

we can bear personal testimony to the fact, that the sea washed in tons over the fore part of the deck of the *Caradoc*, one of the new crack Holyhead and Kingstown packets, while crossing at the self-same hour. Not far from the models of the royal packets, was one of the screw steam yachts, built by Mr. White, of Cowes, for the Emperor of Russia. The *Peterhoff* seems much such a vessel as the *Fairy*—very fast, extremely elegant and graceful upon the water, and made a good sea boat by the very force of her lightness and buoyancy, combined with a sharp wedge-like outline, which enables her to slip through head seas, offering them but a very trifling resistance.

In the same case was a large handsome model of a Gravesend boat, the *Jupiter*, said to be the fastest on the river Thames. She is immensely long and narrow, with vast paddles, and will probably go at high velocity, but is only intended for smooth water. Close to her was deposited a curious contrast, in the shape of a model of a Roman galley, showing the way in which the oars were worked on board these eminently clumsy vessels. Beneath the water-line, the model is round and lumpy, with very little indication of a run, but we much doubt whether any authority exists for the exact mathematical proportions actually observed by the early Italian shipwrights. What may be called the main deck is very low down indeed—a mere flooring, in fact, above the keel; but upon it are erected double platforms of four different heights, each platform seating five or six rowers, who grasp the vast sweeps by which the vessel is propelled. The arrangement of these sweeps is curious. The circular holes through which they pass, run diagonally from the upper gunwale sternwise towards the keel, the benches within, of course, observing a similar disposition. Upon small patches of deck, running round the bulwarks, and crossing from side to side—somewhat in the fashion of a steamer's paddle-bridges—the warriors stand; and at the stem and stern there are species of covered receptacles surrounded

by circular wooden roofs, which afford shelter from the weather and the sea. It is difficult to get anything like a clue to the actual accommodations for the residence of a number of men in these ships. The slaves who rowed—and awful slavery it must have been to tug these long heavy sweeps—probably took up their sleeping quarters upon the pricking-for-the-softest-plank principle.

The two *moyen-age* ships—the *Harry Grace de Dieu* and the *Royal Sovereign*, built by Charles II., were well worthy inspection. The former model was rigged, the latter only a hull; her form and general mould, however, differing in no remarkable respect from, and showing little advance in construction, over her predecessor, although the latter was built not less than 113 years before her. Both ships are piled up with huge unwieldy masses of forecastle and poop. In the *Harry Grace de Dieu*, a number of circular sentry-boxes, or watch-towers, rise all round the bulwark, as though it had been the outer wall of a fortification; and the port-holes are surmounted by ranges of loop-holes for musketry. The *Royal Sovereign* appears to have been built rather for purposes of pageantry than war. She is elaborately carved, principally with Roman emblems and devices: but we miss the warlike appendages of turrets and pepper-box towers which gave the true *moyen-age* ships the air of sailing castles—the idea of the architects having, indeed, manifestly been to manufacture a species of feudal floating fortress. The rigging of the *Harry Grace de Dieu* shows us the earlier stages of the combination of the still existing square rig, with the lateen disposition of yards common to feluccas and their northern offspring—luggers. She carries three masts rigged square, with huge round tops; the two after-masts showing the lateen rig, which afterwards changed into the common schooner fore-and-aft mode of slinging the yards, still in existence, and which is based upon the same principle as the felucca arrangement of the Mediterranean. Altogether, the two models are so interesting as to make us again regret that they only show two incidental eras in the history of our naval architecture—two accidental links

in the chain which began with the log or bark canoe, and ends for the present with the 120-gun ship, carrying 84-pounders on her lower decks, and flinging thousands of pounds of iron at every broadside.

The general characteristics of the life-boats exhibited, took for their common principle of buoyancy the construction of an air-tight lining in the interior of the boat—the space between the outward and the inward sides of the vessel gradually widening until a very broad gunwale is formed. In other specimens, the air-tight cell was placed lower, running in the form of a square or circular box round the boat. A few specimens were fitted with cork belts and finishings. There were several adaptations of surf-boats, built open beneath, the buoyant agency being placed entirely in the sides, thus letting the seas break in and out—the level in the water of the boat being never altered: the bottoms of some of the life-boats consisted merely of cross bars, on which to rest the men's feet. The United States showed several surf-boats, or oblong spherical cases of metal to contain air, for passengers to be conveyed in them, for a short transit through the breakers.

The Lowestoft and Yarmouth life-boats had their buoyant apparatus in the sides beneath the thwarts; the oars double-banked, and beside every man was a pump for getting rid of the sea when it filled the boat. A label attached to these boats stated that they are in use over a range of coast of about twenty miles; that not one of them has been ever upset, and that they have saved from 500 to 600 lives. The "Infallible Life-boat" was a whimsical construction, entirely open at the bottom; and made, indeed, exactly after the same fashion, bottom and top. A Land's-end life-boat was remarkable for the horizontal cuts or longitudinal openings, like loop-holes, piercing her sides in continuous lines; beneath she was open to the water. Holbrook's iron bottomless life-boat was well worthy attention; as was also Bonney's life-boat, which had been experimented on in the Serpentine and the Thames with unvaried success. Two boats, also of a novel kind, were exhibited by Erskine: one

propelled by new pinion-wheels and self-acting syphon pump; the other fitted with revolving air-tight cylinders, life-protecting rings, &c. Haly exhibited his "Catamaran," and a salvage-boat, wholly formed of metallic tubes, serving as atmospheric and hydraulic chambers, with loaded keel and self-shifting wheels. South Shields and Whitby also had their respective ingenious inventions; and Skinner exhibited his Aberdeen "Momentary-motion Life-boat," possessing the self-righting power under all interruptions.

Dyne's Life-boat is built with diagonal battens, laid lattice-wise; its outer sheathing formed of gutta-percha: its buoyancy is 350 cubic feet of air, capable of sustaining upwards of nine-and-a-half tons, and letting off shipped water by 3,600 holes; in the convexed bottom are three perforated steadying fins, and between them two tons of water, not one ounce weight to the boat when upright: there are also galvanised springs placed at the stern, to act like railway buffers in collisions; besides fusees, rockets, and other lights. The same inventor exhibited a Portable and Folding Emigration Life-boat, to be put in requisition in a few minutes; and, in wreck, to carry provisions for 100 persons seven days. The Patent Collapsible Life-boat was exhibited by the Rev. E. L. Berthon, and was stated to enable passenger vessels to take to sea enough boats for any emergency, without crowding the decks: they are always ready for use, "frapped to under the davits;" and, on casting off the gasketts, the boat flies open, and takes into fore and aft cells a large supply of air.

The Northumberland Prize Life-boat.—It will be recollected, that in October, 1850, in consequence of the accidents that had happened to life-boats around the coasts of Great Britain, and more especially the lamentable case off Shields, in December, 1849, when, by the upsetting of the life-boat, twenty of the best pilots out of the Tyne were drowned, his grace the Duke of Northumberland offered a reward of 100 guineas for the best model of a life-boat; the result being that 280 models and plans were sent to Somerset-house for competition.

After a laborious examination of the several models, the six boats that stood first on the list were, for the third time, placed side by side, their several points again examined, and the models carefully compared with each other; the result was a confirmation of the former numbers, and to Mr. James Beeching, boat-builder, of Great Yarmouth, was adjudged the premium for the best model.

The report of the committee appointed to examine the models is a very important and interesting document; and, besides recapitulating the peculiar features of several of them, details the requisite qualities of a life-boat; the accidents to life-boats; the number of shipwrecks on the coasts of the United Kingdom; the life-boat, rocket, and mortar stations; the meritorious conduct of the coast-guard service; and suggestions for decreasing the number of wrecks, &c.

The form given to this boat would make her efficient either for pulling or sailing in all weathers; she would prove a good sea boat, and in places such as Yarmouth, where there are always plenty of hands to launch a boat, her weight would cause no difficulty. By means of the raised air-cases placed at the extremes, the absence of side air-cases for a length of ten feet amid-ships, the introduction of two-and-a-quarter tons of water-ballast into her bottom when afloat, and her iron keel, this boat would right herself in the event of being capsized; although, from the form given to her, it is highly improbable that such an accident should occur.

One day in November last this prize boat made a trial trip out to the Goodwin Sands, and proved herself of the most extraordinary qualities as a sea boat. Captain Charwood, the inspecting commander of the district of the coast-guard, with Lieutenant Simmons and Mr. M'Donald, the master of the *Rose* revenue cutter, and a crew of fourteen picked men, went out in her to the Goodwin, where she was placed in such positions as to allow the surf to have the greatest effect upon her. Nothing could exceed the admirable style in which she behaved; and enough was

seen to satisfy the officers and men who were in her that she would weather the most tempestuous sea. Her sailing qualities were also tested with the most successful results; indeed, it is said that if it were possible to throw her on her beam ends she would not go over. Such was her buoyancy, that when filled with water she cleared herself to the grating in about twelve seconds. The success of the boat has been the source of much gratification along the coast.

Life-Preserving Contrivances.—A variety of buoyant articles of clothing were exhibited: they might be worn as every-day clothes; and included "yachting jackets" and ladies' paletots, described as capable of supporting the wearer in the water. Many other means of support in the water were shown; such as belts, to be inflated by the breath, and lumps of cork, threaded like beads, to be put round the body. Waterproof trunks, made so as to serve as supporting media in the case of shipwreck, were exhibited, with models illustrating their easy adaptation to the purposes of rafts. Air-tight mattresses were shown, suitable for hammocks and berths, and which, of course, are exceedingly buoyant; together with "floating buoyant settees," (with air-tight gutta-percha cases,) for the decks of passenger steamers; and a marine floating chair for three persons. There were likewise exhibited Carte's life-buoy (circular belts); swimming-gloves, web-fingered; and swimming-boots, the soles fastened to flat pieces of wood, to which are attached flaps or leaves working by hinges; India-rubber cloaks, capable of being inflated, when they become small buoys or boats; and Caulcher's cork-ribbed jacket, to be worn, without inconvenience, whilst rowing a boat.

In the American department were several buoyant contrivances, made of vulcanised India-rubber, for saving life under peculiar circumstances. The apparatus of the Royal Humane Society was exhibited; including their ice-boat, constructed of wicker-work, covered with raw hides, and from its lightness easily propelled on the ice to

the broken spot; the breaker ladder, with air-tight barrels, on wheels; the ice-sledge—two canoes united by thwarts into a floating platform; rope-drag, and pole-drag; the latter by an air-tight cylinder rendered a floating-drag. Here, too, were exhibited the life-boat and models of the National Institution for the Preservation of Life from Shipwreck. There was also shown Light's invention for rendering ships' boats so buoyant that they become life-boats; by filling the spaces between the timbers and beneath the thwarts with a very light material, and covering it with thin boards; and, should the bottom be stove in, the frame, held together by the fibrous material, would float as a raft. The process can also be applied to any part of a ship, or boat, its mattresses, or other furniture, so that each may become a life-buoy.

Grapnel shots, with mortars for their projection, to aid wrecks, were exhibited. The shot had attached to it a strong but light line; and consisted of loose curved arms, which fly out on being disengaged from the gun: when the line being pulled from the shore, the implement fixed in the bottom, anchor-like, and the boat's crew had the means of warping themselves off. Of the same class was the rocket-gun, for carrying a 600-yard line from the shore to a wreck, or *vice versâ*. Another model proposed to project a small anchor to the wreck; another to propel a line without the use of gunpowder; and next were shown the life-boat and mortar apparatus of Captain Manby, the venerable patriarch of this family of humanities.

Sir W. S. Harris's Lightning Conductors for Ships.—Among the nautical inventions, were exhibited practical models to illustrate the system of Conductors, invented by Sir W. Snow Harris, and now employed to protect the ships of her Majesty's navy from lightning. In the principal model was shown the line of conduction on the masts from the vane-spindle to the step; to the keel at the sides, and at stem and stern; and in the other models were seen the plan and construction of the conducting plates, showing the alternate jointing of the plates, &c. Copper was selected

as the best conducting metal, and was in rods three-quarters of an inch in diameter; each mast having its conductor, "permanently fixed and connected with bands of copper passing through the sides of the ship, under the deck-beams, and with large bolts leading through the keels and keelson; and including, by other connections, all the principal metallic masses employed in the construction of the hull. Under such a system, a discharge of lightning falling on a house or a ship, finds its way to the earth or the sea, without the possibility of danger. The great principle in applying such conductor, is to place the ship or building in the same electrical condition it would assume supposing the whole were a solid mass of metal, or as nearly as may be; and the conductor should be applied so that a discharge of lightning falling on the general mass cannot enter upon any circuit of which the conductor does not form a part." Since these conductors have been employed in our navy, no damage from lightning has been recorded.

CHAPTER XI.

FOREIGN AND COLONIAL DEPARTMENTS—*continued*— ABORIGINAL STATES.

BRITISH GUIANA—CASSAVA BREAD—PLANTAIN MEAL—JUICE
OF THE COW TREE—VARIOUS WOODS—PRIMITIVE CANOE—
ORIGINAL HAMMOCK—GUIANA POTTERY—SIOUX SADDLE—
MODEL OF CARIB HOUSE—NATIVE DWELLING IN GUIANA
—WESTERN AFRICA—CALABASHES, ETC.—PALM OIL, ETC.—
EGYPT AND TUNIS—ARAB'S TENT—GYPSUM CARVINGS—
MALTESE CONTRIBUTIONS.

THE first, and perhaps the most powerful and lasting impression received by an attentive visitor at the Exhibition, when looking through its vast collection of articles from

every region on earth, was this—that all men, differ as they may in other important points, more especially the uncivilised from the civilised, nevertheless obey at least one law in common: they all, without exception, but in very different degrees of intensity, *labour*. The judgment that man shall live by the sweat of his brow was here exemplified to the full, although a consolatory experience also proves that the curse may largely bring out its own relief. The most careless glance, however, at the multitudinous display of the material results of all men's industry, established some striking distinction in quality among them, even whilst unity in one respect of effort was recognised; and it cannot but be useful to examine the several masses of products in detail, in order to search out the causes of the obvious difference in their respective values.

The articles indicated in the title of this chapter—for example, the productions of those who are commonly called Aborigines, or the less civilised races—are substantially the inferior fruits of human industry. Yet they illustrate the primitive elements, out of which the most advanced nations have elaborated their gorgeous and graceful, their eminently useful productions. The most polished nations may in them trace their own perfection backward to its source. Then, these aboriginal productions suggest, in their rude aptitude of purpose, sometimes in their skilfulness, irresistible arguments to the more refined, to look with greater indulgence upon their struggling fellows, by whom such interesting productions are made. The highly civilised man, rendered by science familiar with the works of uncivilised people, will subdue his own prejudices in regard to their incapacity, and soon come practically to aid them to acquire the superior qualifications that shall rightfully place them on his level.

China and India have so much in common with us, in their manufactures, their arts, and their agriculture; and they have made so much progress already in many respects, that purely *aboriginal* products are comparatively few in those countries, but both possess some worthy of notice.

Ceylon and the Indian Archipelago have sent us more such ; and Africa still more, from all its quarters—east, north, west, and south. Turkey, although still too resplendent in “barbaric gold,” instead of cultivating the best taste, is fast assuming the great forms of our civilisation ; and Russia will bring from its remoter tribes only, anything of a purely aboriginal character. North America, in its prodigious new wealth of products of art and industry, offers some scanty memorials of deep interest from its aboriginal tribes. Central and South America could have presented most curious combinations of civilised and uncivilised manners as now existing, and have sent us remarkable means of comparing the civilisation that existed before the New World was revealed to Europe, with the improvement introduced by Christians at a frightful cost of human life. Both regions, distracted with civil discord, have contributed a little—very little ; but one South American British colony, Guiana, has made a zealous response to the call from home.

A rapid survey of these poor treasures of the primitive man's ingenuity, still in his own hands, will unquestionably tend to allay the melancholy feeling too prevalent among us, that numerous portions of our race should be doomed by Providence to perish at the approach of their more instructed brethren. Facts encourage a nobler and a wiser prospect. A capacity for a safer and better condition of life is clearly established by these productions of industry—exercised in every climate, within the burning tropic and at the pole, by Negro and Esquimaux ; by the gloomy American forests, and over the bare steppes of Tartary : by the half-amphibious islander of the Pacific equally as by the Kaffir, to whom an iron-bound coast and unnavigable mountain streams refuse the use of the simplest boat—each, however, having his peculiar occupation. All this confirms the oft-repeated judgment, that art is natural to man, and that the skill he acquires after many ages of practice, is only the improvement of a talent he possessed at first. Destined to cultivate his own

nature and to mend his situation, man finds a continual subject of attention, of ingenuity, and of labour.

The same satisfactory conclusion was supported by analogous materials in the Exhibition, and more abundant ones than the purely aboriginal products. These were the contributions obtained for our daily use by the combined labours of civilised and aboriginal men. They are the raw materials of commerce to an enormous amount in quantity and value; the dyes, the gums, the drugs, the oils, the seeds, the woods, the woven and textile plants, the leaves, the roots, the skins, the furs, the feathers, the shells, which promote so largely the comfort and adornment of social life. The several departments of each civilised nation in turn have received these contributions from the barbarian, and sometimes from the savage—the aborigines—whom, in return, civilisation has not yet discovered a better way to manage, than by almost incessant warfare. It is a capital point, in considering these raw materials of the arts, to know how to obtain them in a *genuine* condition; and on this point it will be found that our interests as manufacturers and merchants, and consumers, coincide happily with our duties as men. Exactly in proportion as the native collectors of nature's stores are well treated and well instructed in the best ways of civilisation, the more expert are they, and the more disposed to be vigilant and honest in their work.

British Guiana.—The survey of aboriginal products in the Exhibition may be conveniently begun with British Guiana, as the collections from the colony were remarkably complete, and it is a country admirably described by Sir Robert H. Schomburgk, one of the most accomplished of modern travellers. It is a portion of South America on the Atlantic, in latitude six degrees north of the equator, and contains forty-eight and-a-half millions of acres of land. The staple produce is sugar, rum and coffee, with some cotton. Other produce of less value are its plantains and various esculents, with timber and other articles approved by the experience of the

aborigines. The chief food of the natives, the cassava bread, was to be seen here ; which it is seriously proposed to export to England, as being superior to the potatoe in nutritious quality, and so much more abundant than any meal known, that a profit of £50 per acre may be gained by its culture. The graters used by the natives in preparing the cassava meal from the root are the manufacture of particular tribes, famous for this business, as others are especially famous for the manufacture of hammocks—the materials probably in both cases being abundant in their countries ; as Manchester owes its ancient celebrity to the streams and coals of its neighbourhood. The cassava bread is made in an elastic tube, called the *metappée*, a very ingenious contrivance of the Indians, says Sir R. Schomburgk, to press the juice from the root, which is one of the most violent poisons before being pressed. After the root is scraped, it is pressed in this tube, plaited of the stems of the *calathea*. A pole in the tube is used as a powerful lever, and weighed down by two persons sitting on it. The juice escapes through the plaited work, and the dried meal is baked in a pan in a few minutes. A specimen of the machine, as well as of the bread, was in the Exhibition. Another new article of food was also exhibited—the plantain meal—which the Indians use ; and our settlers calculate it may be made to produce a gross return of £112 per acre ! Well may Europeans be surprised, as Humboldt says they are, upon arriving within the tropics, at seeing the small space of ground that keeps an Indian family. The juice of the cow-tree, sometimes used as a substitute for *milk*, is perhaps more valuable as one of the numerous materials for India-rubber. The physic nut, in common use by the natives, is one of the hundred vegetable medicines of the American forests, well worth further study. There is also a species of Jesuits' bark, of far greater importance, considering its dearness almost prohibits its proper application in our hospitals ; and this, also, is well known by the Indians.

But the most valuable articles exhibited from Guiana

were the woods, originally made known to us by native experience. For ship-building, they are certainly superior to oak and teak; and the bright colours of the specimens strongly recommend them for furniture. In regard to ship-building, it is a curious fact, attested by Sir R. Schomburgk, that one tribe in particular, the Warraus, have been famous builders of canoes and corrials, the durability and speed of which far surpassed any boats from Europe. They made a class of launches, carrying from fifty to seventy men, celebrated in the last revolutionary wars. The timber they selected, the mora tree, is now acknowledged to be the very best for the purpose. Specimens were in the Exhibition. A more primitive canoe was exhibited also, made of the bark of a tree, quickly constructed, of extremely light draught, and portable. Its convenient use in this last respect, carries us back to the days of our most primitive forefathers, when the wicker and skin boat, still to be seen on the Wye and in Ireland, was easily borne on the shoulders of the adventurous waterman, when obstacles impeded his navigation, or he wished to surprise a neighbour at a distant stream. In this collection, too, we observed the original *hammock*, which we have so extensively adopted at sea, and which in France is wisely used in crowded rooms, from which it can be removed by day to purify the air. It is interesting to know that the Indians make their hammocks of extraordinarily strong textile materials, new to us, and of excellent cotton. Nor is it less interesting to learn that the sugar of Guiana, of which specimens were exhibited, has furnished the native people with one comfort from us, which they appreciate. They now grow sugar for domestic use; and the cane they cultivate is universally of the kind introduced by us from the French. Cook found it in the the South Seas; Bougainville carried it to Mauritius; and thence, by way of the French West Indian Islands, it has spread, within about seventy years, over the civilised and aboriginal Western World.

These aborigines, then, can adopt our improvements.

They possess, also, the elements of the potter's art, which usually denotes a decided advance from savage life. The mere savage is content with what nature has provided to put liquids in—a sea-shell, a gourd, a part of an egg; the Indian of Guiana manufactures his buck-pots of clay, a specimen of which was exhibited. In a new edition of Marryat's beautiful *History of Porcelain*, the catalogue of such utensils, from those of Egypt to those of Peru, should be enriched by well-authenticated examples such as these among aborigines. In some instances the aborigines are proved to have completely adopted our usages. From Nova Scotia samples of wheat grown by Indians were sent of the same respectable weight (64 lb. 11 oz. to the bushel) as our own farmers' wheat. The Sioux saddle and hunter's belt, wrought by an Indian maiden, sent by a citizen of the United States, is entitled to be accounted a work of "honest housewifery," quite as much as the carpet wrought for our gracious queen by the three hundred English women. So the New Zealand chief, Tao Nui, who sent his contributions through his London agent, Mr. Gilman, surely has ceased to be an uncivilised man. These contributions were, however, thoroughly aboriginal "specimens of New Zealand woods, gums, and bark, flax and flax manufactures." The same conclusions may be drawn in favour of the capacity of the North American Indian to adopt our usage, from the model of the house of the once wild Carib, the cannibal of Columbus, with every household convenience most minutely represented. The easy chair, the wax taper, the neat table, the tinder-box, the old man's modern bed, as well as the aboriginal hammock, various musical instruments, various cooking utensils, the sugar-press, cassava-pot, the grind-stone, the neat mat, even the grog-can and a hundred other articles were there, to show the profusion of comforts which civilisation produces. And yet this is the race, thus making progress under a little protection, to which we often refuse common justice; and then we wonder that they flee to the bush. This little Indian picture of civilised barbarism is

a lesson that should be perpetuated by such a simple work being deposited in the British Museum, now that the Exhibition is broken up.

The models of Guiana native dwellings, also, were very interesting, as furnishing, in the abundance of their domestic comforts, some guarantee for their permanence in one place, so that they have clearly arrived at a condition beyond that of nomadic life. Other South American *models* were exhibited; for instance, there was one of a native raft in the Brazil department, although none, as far as we could find, of the far more curious flying bridges which span the awful abysses of the mountains. Mexico and New Grenada, Chili and Peru, are no longer subject to civil disturbance so continually, whatever may be the case with Central America, but that their engineering wonders of that character, from very old times, might have been produced with advantage.

Western Africa offered articles so various in kind, so abundant, and so valuable in commerce, that when compared with the barbarism of the people, they irresistibly compel the admission, that trade alone does not solve the problem how men are to be civilised. These Africans, in particular, are most active merchants; and they have one usage which should strongly recommend them, as it furnishes a proof of their respect for honest dealing. If a bale of goods is not found at its place of destination to answer the sample, it may be returned to the broker, who is bound to get compensation from the original seller for the purchaser. The specimens of cotton, both raw and manufactured, from this region, were numerous. The plant grows everywhere; and if our best sort should be found worth substituting for the native varieties, the habits of the people are prepared for its adoption. The pottery works were very various, although calabashes, or vegetable vessels, were common. Dyes and medicines were abundant; and it is to be noted with regret, that poisons are familiar to the natives for the worst purposes. One article of export collected by the rudest people of West Africa is of

great value, and it has an interesting history. This is palm oil, the import of which has increased, since the abolition of the slave-trade, from a small amount, to more than 20,000 tons a year, worth more than £600,000. This new African trade in a legitimate commodity is interesting, as a proof of the correctness of judgment in one of the earlier friends of negro emancipation, whose very name has been forgotten in the long catalogue of the friends of that cause. Mr. Thomas Bentley, of Liverpool, a predecessor of Sharp, and Clarkson, and Wilberforce, was sagacious enough to perceive, and bold enough to maintain, when a merchant in that slave-trading port, that some articles existed in Africa more suited to the conscience and commerce of Englishmen than negroes. He told his fellow-townsmen that they should send their ships, not for slaves, but for *palm oil*; and now it is for Mr. Thomas Bentley's palm oil that the very fleets are sent, which, but for the efforts of such men as he, would still be groaning with human victims. This good man became the partizan of Wedgewood, in the famous potteries, to the beauty of which his excellent taste secured their most successful character.

From Western Africa were also sent the small leathern bottles of dye for the eyelids, which along with other like usages have been cited to prove the assimilation of the negroes with ancient Egypt. The real aboriginal products of both regions are well worth comparing together, in order to illustrate the question.

Let us now take a survey of the contributions of Egypt and Tunis; the former of which, in addition to their intrinsic merit, were interesting from the imperishable halo of association that surrounds the land from which they came—a land which has been the seat of four civilisations, essentially differing from each other, and spread over the lapse of 4,000 years; for while Italy and Greece have been at particular periods more resplendent by cultivation of the arts, Egypt is the only country that still shows in its monuments distinct traces of four successive epochs of civilisa-

tion—a Pharaonic, a Greek, a Roman, and an Arabic. This, no doubt, springs from the peculiarity of its physical geography, as a country of vast territorial wealth within a narrow space, and forming the connecting link between the Red Sea and the Mediterranean; while to the Englishman, more than to any other inhabitant in Europe, Egypt has become, since the development of steam navigation, the portion of the East, the political condition of which bears most immediately on the communications between our vast Indian empire and the metropolis. There was a time, and that not long since, when our relations with the government of that country were of the most hostile nature; but it is satisfactory to think that the most amicable intercourse now reigns between them. No Englishman in his senses thinks of a military occupation in Egypt similar to that which was attempted by France. The objects of the British government limit themselves,—first, to the exclusion of any European power from military possession of the key of the Mediterranean and Indian seas; secondly, to the development of our commerce in Egypt; thirdly, to the facilitation of the Overland traffic. And it is satisfactory to find, that the present pacha shows every disposition not only to promote and protect our passenger traffic, but to cultivate the most amicable relations with the government and inhabitants of this country.

In Egypt the extraordinary change that has been imprinted upon the administration, the commerce, the agriculture, and the manners of the higher classes (for those of the great majority of the people remain untouched) has been effected by the will of one *man*. It is true that Mahomed Ali sometimes misapplied his resources, but there can be no doubt of the extraordinary mental activity of the individual; there can be no doubt that all the productions of Europe have been subjected to study—that their application to European commerce has been tested—that the climate and soil have been studied, and that vast numbers of experiments have been made in the vegetable world, and that many plants have been successfully naturalised, while

the indigenous products have been much improved in quality. The Nile is the great feature of Egypt; let us, therefore, begin with the upper country. Highest of all were the articles from the Belledes-Asoudin; elephants' tusks, sections of ebony from Senaar; a rhinoceros horn, and other objects from the "land of the blacks," as the term means, of which the most valuable is gum. Upon this trade the genius of Mahomed Ali, remarkable as it was in many respects, had not a favourable influence; the European regulations and police, which he established with absolute power, rather frightened away than encouraged those who had objects of this description to sell from the interior of Africa; but, as the system of the present pacha is less stringent, there is every prospect of an extension of this portion of the trade. And to this object, unquestionably, nothing would so much tend as the establishment of a fair, once every winter, at Essowan, which is the highest point that can be reached by steamers from Cairo, and is on the borders of Nubia.

In Upper Egypt itself, the principal objects of production are dates, corn, sugar, and Indian corn; the first of which is the most striking feature of the Egyptian landscape, and which is almost as familiar to the eye of the European, by thousands of faithful representations, as to the Egyptian himself. On closer examination of the vases in which they are kept, we see the varieties of their colour, some being of a dark red, some of a light brown, and others of a cream colour. Not only is the date an excellent food for the common people of Egypt, but we saw in this Exhibition illustrations of the variety of purposes to which they are applied: here were the crates of the branch of the palm; the fly-flappers of palm leaves, used by servants while the masters dine; and, moreover, specimens of the cordage into which the palm fibres are made, and a coarser description of which is in universal use in the Nile boats. When we add, that the trunk of the palm is used for timber, that the nuts are used both as camel fodder and as a combustible for the preparation of human food,

and that, moreover, a tenacious hairy sort of fibre from the palm is used in cleansing the skin in baths, it is scarcely possible to over-rate the value of this tree. Sugar-cane and sugar-loaves were also exhibited, the latter from Ibrahim Pacha's refinery. This remarkable man made great efforts to push the sugar cultivation in Egypt, for which there can be no doubt that both soil and climate are well adapted; but the great proportion of the sugar used in Egypt is still imported from Europe; for, whatever the will of Ibrahim Pacha may have been or whatever may be the natural capacities of Egypt, the incurable indolence of the people and their indisposition to labour, seem to be an invincible obstacle to Egypt ever competing with Europe in price and quality as far as this article is concerned. The true calling of Egypt is, unquestionably, that in which nature herself—the sun and the Nile—have the largest share in the production. It is by her wheat, her cotton, her beans, her barley, her sesame, her linseed, and her flax, that Egypt can increase her wealth with certainty. It is agriculture and commerce, not manufactures, that nature has assigned to Egypt in the territorial division of labour. Of these the most important is certainly cotton, from the great extension of its culture during late years. We particularly remarked a specimen of Sea Island cotton, cultivated by Mr. Larking, in the environs of Alexandria. This ingenious gentleman has devoted many years to the horticulture and agriculture of the Egyptian climate, and has been the means of reclaiming from the Lake Mareotis a large tract of land, which would otherwise have been useless, by diverting from the canal a portion of fresh water, which, washing away from the alluvial soil the saline particles, has left the earth cleansed and productive. He has also been at pains to introduce, upon a most extensive scale, the British system of agriculture, and the Belgian method of cultivating flax; but the inveterate habits of indolence and pilfering in the natives have prevented the experiment from being so successful as could have been wished.

In the Exhibition was to be seen one of those curious machines with which the Egyptians conduct their agricultural operations (marked 174 in the catalogue), which shows that the ease-loving countryman makes his own weight contribute to do the work, while he is saved the trouble of walking. The catalogue stated that the object of this machine was to sow seed; but, unless we were much mistaken, it was the machine used for the double purpose of thrashing corn and cutting the straw; the oxen performing a rotary motion until all the straw be cut and the corn squeezed out. Of other vegetable productions were specimens of opium and senna, which are well suited to the climate; tombak, which is used as a substitute for tobacco; and rice, which is grown in very large quantities on the low grounds of the Delta, not far from the sea, and cleaned for the most part at Damietta and Rosetta, where mills have been established on the American principle with great success. Nor must we, in our list of vegetable products, omit the rose-water of the Fayoum, which is so frequently mentioned in the songs of the Arab poets; whole tracts of land being devoted to this culture, and, in the season of plucking, diffusing fragrance through the smiling land. It is also in the Fayoum (which is a district to the west of the Nile above Cairo) that are to be found the greatest quantity of olives, large plantations of which have been re-established by Ibrahim Pacha in various parts of Egypt; for the culture of olives had much fallen off under the Mamelukes. The mineral productions of Egypt were very numerous, the most magnificent of which, in the Exhibition, were the slabs of Oriental alabaster, from the quarries to the south-east of Cairo, in the desert, and out of which material the columns of the new mosque of Mahomed Ali, in the citadel of Cairo, have been constructed. There can be no doubt, that, if the value and the beauty of this mineral were better known in Europe, and if a railway, of however rude and cheap construction, could be established to Beni Souef, on the Nile, it might become an article of export of the greatest import-

ance. As a native manufacture, having a mineral for its component, we may also draw attention to the porous water-bottles made at Gheneh, on the Nile, which are in universal use in all parts of Egypt, from their peculiar quality of exuding the moisture, which by evaporation cools the water within. If we descend the Nile to the entrance of Cairo, we see another mineral production, in specimens of the petrified forest of a valley in Mount Mokattam.

The Cairo articles must be regarded under two aspects—those which are indigenous, and those which have been introduced by the late pacha as subservient to his military and political system. The latter need not engage our attention, as they have no local peculiarity, however illustrative they may be of the superior mental activity of the family of the present pacha. Of the former, we may mention the saddles of crimson velvet, the padded one being most easy and convenient for riding, giving a good hold to the knee; but the high cantled saddle is the most interesting, for it is of the same form as that in which Saladin and the Paynim host used to receive the shock of the Frank crusader; the saddle of Negm-Eddin, whose name is so associated with the expedition of St. Louis to Damietta, being still an appendage of the mosque, that, after six centuries, bears his name. In no respect had the desire of Mahomed Ali to leave his impress upon his country been more successful than in his efforts to promote public instruction; and the schools he established in Egypt will unquestionably do more for his reputation than the wars in which he was engaged. The printing-press at Boulak has been sufficiently described by travellers; and we have had specimens of its work in an Egyptian edition of the “Arabian Nights,” and other productions of typography; the works themselves being remarkable, not so much for their beauty of print and paper, in which they cannot compete with Europe, as for the excessive lowness of price. The articles of dress are so numerous, and are brought in such quantities by travellers to this country, that we need not take up the

reader's time any further; simply remarking, that while many of the imitations of European manufactures have not been successful as pecuniary speculations, that of Tunis caps, established at Fouah, has been in operation for many years, and has been eminently prosperous.

The Tunis court was the first on the right hand after passing through the iron gates at the south entrance. In front it was the width of a single division; but in the rear it was more extensive. The collection of Tunisian productions which were sent for exhibition by the bey of Tunis, under the care of Sy Hamda Elmkadden, pro-commissary appointed for the occasion, and Moses Santillana, interpreter to his Excellency General Sidy Mahmoud Benyad, the bey's commissioner, were more remarkable as matters of curiosity than for their intrinsic value or importance. The most striking features in the outward show were some carpets, rugs, and blankets, and a variety of singularly-fashioned garments, for male and female, of a mixed material of silk and worsted, and of all shades and mixture of colour; caps of various denominations—calabash, orta, sake, majidia, kaleb-shed, &c.—turbans, and other head-gear; silk scarfs; in short, an endless stock of gentlemen's and ladies' "left-off-clothing"—just such a stock as one might expect to see in a native old clothes' shop at Algiers or at Cairo. Two hats of gigantic proportions, in red morocco, were the astonishment of all beholders. In the inner room were others of similar dimensions, but made of straw, and ornamented with leather patches. The shoes, boots, and slippers of red, green, and yellow morocco, attracted the attention of the curious, as also some very substantial saddle-bags of the same material, which, divided in two, might form very serviceable packs for a walking tour in Wales or Switzerland. Then there were samples of seeds, of saffron, of indigo, and glass jars full of sweetmeats, which last-named the good-natured Turk in charge very freely dispensed, with wild gestures of welcome, to gaping juveniles as they passed. Arms and gun-locks, of clumsy make, were displayed in another com-

partment; in another various articles for domestic use, made of iron, tin, leather, and pottery, and of very primitive fashion; squares of "household soap," some candles also, veritable "dips" of a dirty brown colour. In another we found musical instruments, including a lute and a timbrel; and strewed about in all directions were skins of animals, dressed and undressed; pieces of matting, parasols, fans, ornaments in gold and silver; claret-bottles filled, some with scented waters, some with Begia snuff; and all sorts of odds and ends, mostly of the rudest description, but all admirably calculated to afford an illustration of the *menage* and *convenances* of the North African tribes. A tent made of camel's hair cloth, which stood in the middle of the room, was a perfect picture; low, dark, dismal—a mere shelter for the mountain wanderer from the blast and the rain; in which saddles, saddle-bags, leather water-bags, leather bottles, leather mats, clumsy arms, and other articles for immediate use, and adapted for prompt removal, were scattered about in admired disorder. In strange contrast to this tatterdemalion lot stood two glass cases, containing some very splendid specimens of gold embroidered dresses and horse caparisons, and other articles of *vertu* selected from the bey's private wardrobe. Nor must we omit to mention some very curious models of arabesque carvings in gypsum, intended for the decoration of the interior of Moorish rooms. Their workmanship was of a bold character, the devices elaborate and pleasing; and the material being pierced through, must have a very light and graceful effect when applied to the purposes intended. Preparatory to the process of carving, the gypsum is inclosed in a wooden frame, with a back to it, which supports and protects it till the design is completed.

Maltese contributions.—The interesting and historical island of Malta—the ancient Iberia; the rock made fertile by the labour of man; the conquered of the Greeks, the Romans, the Carthaginians, the Goths, the old Normans, the French, and the British—made a goodly show at the Great Industrial Gathering. There is a lingering tinge

of romance about the island of so many possessors; and as we gazed on the products of the industry of its inhabitants, we recalled to our mind recollections of the chivalric band, the heroic knights of Jerusalem, successively driven from Palestine and Rhodes; and at last, in 1583, taking refuge, through the favour of Charles V., of the little island in the Mediterranean, the name of which they subsequently assumed. We thought of their grand master, Villiers de l'Isle, who fortified the rock and resisted the designs of the Turkish emperor Soliman; and the words of Sinan, when he surveyed the castle of St. Angelo, rose to our lips: "Dost thou see that castle?" he asks of the corsair, Dragut, when pressed to commence the attack; "the eagle makes not his nest on the summit of a steeper rock. To take it we must have the wings of the eagle, and the courage of the lion; for all the troops in the world would fail in the attempt." A few years later, and we are in the midst of a siege, in which Turks and knights were alternately victorious and defeated—the latter at one time overjoyed and triumphant, and at another retiring to the convent and town of La Valette, carrying on the erection of houses and churches by means of copper coins, on which were inscribed the words, *Non aēs sed fides*. Years pass. The knights of Malta disappear from the scene for ever; commerce takes the place of chivalry; romance retires to its congenial woods and streams; a good queen takes up her residence within view of the waters on which St. Paul suffered shipwreck; the year of jubilee dawns upon the world; and Malta takes her place among the nations in the Crystal Palace.

Besides many interesting specimens of Maltese cottons, silks, lace, flowers, and jewellery—wheat and cinnamon, aniseed and sea-shells, were among the contributions of Malta. The gold and filagree-work of the Maltese has been long celebrated, and many highly valuable illustrations of this important branch of industry were exhibited. Besides these, we had bracelets, brooches, chatelaines, breast and head pins, dishes, plates, bouquet holders,

shawl pins, shirt studs, card cases, candlesticks, and pin-cushions. But perhaps the most important and certainly the most interesting objects in a pictorial point of view, were the vases, jugs, pedestals, and carvings, in Maltese stone, a material highly useful in many respects, as was shown by the specimens oiled and prepared for pavements, the drip stone, &c. In these productions the elaboration of the carvers had been well seconded by the efforts of the artist; and as good specimens of Maltese ingenuity, they were highly valuable. An inlaid marble table, with the arms and emblems of the island in coral and lapis lazuli, with some table tops of a similar description; a vase, with a pedestal of red Goza marble; several rare figures, and some fine stalactites, were exhibited by Messrs. Darmanni and Son, of Valetta, and sufficiently indicated the talents of the manufacturers and the resources of the island.

Malta, in the Exhibition, was situated between India and Ceylon, and next to the Channel Islands; or, to make the description still more accurate, we may say that it was situated N.N.W. of the Crystal Fountain. Thousands of travellers journeyed thither without the fear of sea sickness.

CHAPTER XII.

MODELS.

MODEL OF A COLLIERY—FOURDRINIER'S SAFETY APPARATUS—
SUSPENSION BRIDGE OVER THE DNIEPER—SALTER'S MODEL
OF A BRIDGE AT SELBY—STEPHENSON'S BRITANNIA BRIDGE
—RAILWAY BRIDGE OVER THE WYE—STEPHENSON'S HIGH
LEVEL BRIDGE—OUSE-BURN VIADUCT—SHIELD'S MODELS
FROM NEW SOUTH WALES—MODEL OF THE FALLS OF NIAGARA
—STANZAS BY J. S. BUCKINGHAM.

MODELS are still more instructive than drawings, or even than the machines themselves. The Exhibition afforded

some striking and interesting examples of the advantages of such means of illustration. We would especially direct attention to the model of a colliery, which was to be found in the department of machinery. No one, even amongst those who have themselves practically explored coal mines, can fail to be struck with the clearness of perception which is obtained of such works from this model. Thus we had, first, those parts of the works which are above ground exhibited, such as the mouths of the shafts and the engines which work them. There was, first, the shaft by which the coal is raised; next, that by which the mine is drained; and third, that by which it is ventilated. This latter process is usually accomplished by a furnace, which creates a draught of air up one of the shafts, and is necessarily followed by currents of air down the others. In the lower part of the model was exhibited the state of the workings. The beds of unworked coal were represented by a black *stratum*, the workings being exhibited by cuttings through it; the railways being shown upon which the waggons move, in which the coal is brought to the bottom of the shaft, and through which it is elevated by the power of the steam-engine erected at the top. The partitions and other contrivances to regulate the ventilation of the works were represented by brick-work in this interesting model. The timber supports used for sustaining the roof of the workings were also shown.

Coal mines, or coal fields, as they are sometimes called, differ from one another in the thickness of the bed of coal and in the position in which it lies. In some the thickness does not exceed eighteen inches; in others it amounts to many feet. In the coal fields of Northumberland and Durham (from which the model was sent) the average thickness is twelve feet; and, consequently, each acre contains 19,360 cubic yards of coal, each cubic yard weighing, on the average, one ton. The extent of the coal area in Northumberland and Durham is, in round numbers, 500,000 acres, and, consequently, its total contents amount to not less than 10,000,000,000 tons of coal, of which

1,500,000,000 only have been worked. The present annual consumption of coal is estimated at 10,000,000, including the waste; and it consequently follows that, at this rate, it would take above *eight centuries* to exhaust this single field!

Not the least remarkable circumstance suggested by this model, is the prodigious depth at which this subterranean industry is carried on. In some cases, the depth of the workings is 1,800 perpendicular feet, or one-third of a mile; and the area of a single set of pits sometimes amounts to 1,000 acres. The manner of working the beds might be collected, in some measure, from inspecting the model. The coal itself is first cut in narrow galleries—that is to say, a space is excavated twelve feet high and four or five feet wide,—and such a gallery is continued in a given direction for a certain distance, as represented in the model. Others are then excavated parallel to it; afterwards a series of similar excavations are made at right angles to these; the result of which is, that there will remain square pillars of uncut coal, formed by the intersection of these rectangular galleries; and the plan of the bed will resemble a chess-board, the black squares indicating the uncut pillars, and the white the open cuttings, only that the square pillars do not touch each other diagonally, as in the case of the chess-board. The use of these square pillars is to support the roof, which would otherwise fall in. After the bed has been worked in this way by parallel and rectangular galleries, the square pillars of coal are removed one by one, and the roof of the working is allowed to fall. This method of working a coal mine is called technically the method of “pillar and stall.”

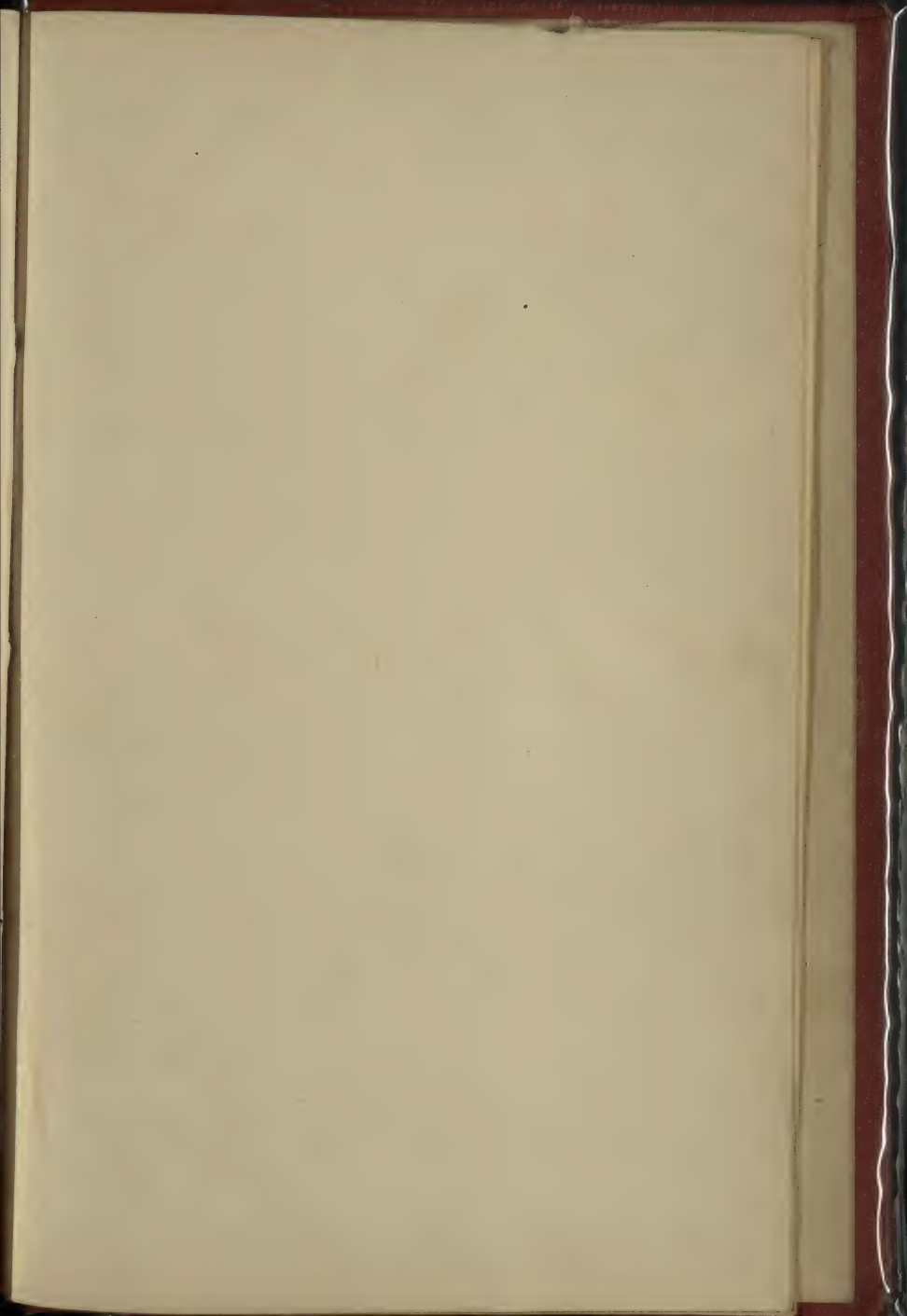
The apparatus for the ventilation of the mine, as indicated in the model, is extremely important, inasmuch as upon its efficiency the safety of this class of industrial labourers mainly depends. The gas, which by artificial processes is extricated from coal for the purposes of illumination, is found to issue spontaneously from the coal in

the mine, in more or less quantity; so much so, that by holding a candle against the walls of this workings, jets of flame may be often produced. When this gas is mixed in a certain proportion with atmospheric air, which fills the workings—a mixture highly explosive—if a flame or spark comes in contact with it, a destructive catastrophe ensues. Good ventilation prevents this evil. The current of air kept continually flowing through the workings, descending at the shaft No. 1 and No. 2 in the model, and rising at the shaft No. 3, is a safeguard against the evil; but, as this ventilation sometimes fails, a further security is afforded in the safety-lamp, which, as is well known, is a lantern surrounded with fine wire gauze, instead of glass or horn. This wire gauze has the property of preventing the passage of flame through it. Flame is nothing more or less than gas rendered luminous by intense heat. In passing through the wire gauze, it parts with so much of its heat to the metal of the wire, that when it has issued from the meshes, it loses the character of flame, and is incapable of producing explosion. According to the returns, it appears that in the Newcastle and Durham coal field, represented by this model, there are about 200 pits or different collieries, employing 26,000 pairs of hands; the value of the coal at the port, where it is shipped, being about 11s. per ton. This, however, is only one of the many astounding examples which the Exhibition presented to the foreign visitor, of the inexhaustible stock of this valuable mineral, which lies embedded in this island—to say nothing of the Irish and Scotch specimens.

There were samples from South Wales, accompanied by models of the apparatus used for shipping the coals at Cardiff dock, where 400 tons per day can be shipped by steam-power, from a coal field presenting about 600,000 acres of coal area, consisting of the sorts best adapted for steam navigation, and thence called "steam coal." There were also, supplied by the Butterly Company, specimens of the Derbyshire coal field, consisting of seams of coal of great thickness. Mr. Atkinson sent specimens of

coal from the Forest of Dean, where there is an area of 36,000 acres, the total thickness being about thirty-seven feet. Specimens were sent from Barnsley, from a bed ten feet thick, forming part of the South Yorkshire, Nottinghamshire and Derbyshire coal field, which includes 650,000 acres, of which there are twelve workable seams, of the total thickness of twenty feet. It appears, in fine, that the total extent of coal area of the British Islands amounts to 12,000 square miles, being about one-tenth of the entire area of the country; their annual production, 32,000,000 tons. With such a stock, and the prospects of those improvements in mechanical science, which will probably supersede steam-power by electricity, the fears of the timid respecting the exhaustion of our coal mines may well be tranquillised. With a knowledge of our resources, we may yet sit round our firesides in comfort.

Fourdrinier's Patent Safety Apparatus for ascending and descending Mines.—Doubtless many thousands of the visitors to the Crystal Palace passed the model of this safety apparatus, without being at all aware of its utility and importance. The national greatness of this country, in a commercial point of view, in a great degree arises from the immense mineral wealth it possesses, more especially of iron and coal. Under the most favourable circumstances, the operation of exploring for these valuable products beneath the surface of the earth, is fraught with many and great dangers; and, it is he only who has actually passed through the ordeal of descending and ascending a mine, that can form any adequate conception of the dangers of a miner's life. We were particularly struck with this fact a few days since, whilst reading the returns of the population of the mining districts of Cornwall, and noticing the number of *widows* in those returns. The mere fact of working at great depths below the surface, where the exhilarating influences of the sunbeam—so essential to health and life—never penetrate, is of itself sufficiently toilsome and wearying, even if the miner were never subject to any other ills. The terrors of the



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